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FORESTRY ABSTRACTS

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THE USE OF AIRCRAFT IN FOREST INSECT CONTROL

PART II

5. RECENT SPRUCE BUDWORM OPERATIONS

Recent operations against the Spruce budworm in the U.S.A. and Canada furnish the most outstanding examples of large-scale forest spraying yet undertaken. Between 1949 and 1954 nearly 7 million acres were treated, and plans for 1955 involve over 4 million acres (Table I). A description of these projects may serve to illustrate some of the problems involved and the present stage of aerial spraying as a method of dealing with major outbreaks.

TABLE I

SUMMARY OF ACREAGES AND COST PER ACRE OF SPRUCE BUDWORM CONTROL OPERATIONS IN NORTH AMERICA SINCE 1949

	Western operations					*Eastern operations*					
	Oregon and Washington		*Idaho, Montana and Wyoming*		*New Mexico*	*New Brunswick*		*Quebec*		*Maine*	
Year	*Acreage*	*Cost*	*Acreage*	*Cost*	*Acreage*	*Acreage*	*Cost*	*Acreage*	*Cost*	*Acreage*	*Cost*
1949	267,000	$1·20	—	—	—	—	—	—	—	—	—
1950	933,000	1·06	—	—	—	—	—	—	—	—	—
1951	927,000	1·06	—	—	—	—	—	—	—	—	—
1952	656,000	1·04	—	—	—	200,000	3·15	8,000	—	—	—
1953	369,000	0·95	134,000	1·08	—	1,800,000	1·40	—	—	—	—
1954	68,000	0·93	—	—	—	1,100,000	1·05	320,000	—	20,000	1·50
Total	3,220,000	1·05	134,000	1·08	—	3,100,000	1·39	328,000	—	20,000	1·50
Proposed 1955	620,000	—	1,175,000	—	440,000	1,000,000	—	1,000,000	—	—	—

Total: Western operations 1949–54 — 3,354,000 acres
Eastern operations 1952–54 — 3,448,000 acres

Grand total — — 6,802,000 acres

NATURE OF PROBLEM

The Spruce budworm is native to North America. Periodic outbreaks have occurred in the Balsam Fir/Spruce forests of the northeastern States and eastern Provinces for at least 150 years and are considered to have been a major factor contributing to the succession of even-aged Balsam Fir stands characteristic of the region [64, 123, 124, 125]. The first records of its occurrence in the western U.S.A. and Canada date from 1915 [94] and there is no previous history of outbreaks. Although apparently indigenous to western North America some doubt remains concerning the sub-specific position of the western form [68].

Outbreaks in the East have occurred more or less continuously since 1909 [47]. Severe epidemics between 1909 and 1919 caused damage to a large part of the susceptible forest from Ontario to Maine, New Brunswick and Nova Scotia. In the next 15 to 20 years, sporadic outbreaks of minor importance persisted in Ontario and began to increase again between 1935 and 1940. In 1945, 125 million acres were infested in Ontario and western Quebec and by 1947 much of the mature Fir and White Spruce

had been killed on about 14 million acres [36, 47]. The seriousness of the situation and the availability of DDT in quantity led to the first large-scale spraying trials in Ontario in 1944, 1945, and 1946. The importance of these trials was in demonstrating the feasibility of conducting aerial spraying operations over large, remote areas at a reasonable cost and with a high % kill. Subsequent studies showed that protection was given the trees for 1 or 2 years, but that reinfestation occurred as the result of a build-up of surviving populations and moth invasion [123].

The peak of the outbreak in Ontario and Quebec north of the St. Lawrence River was reached in 1948, but new centres of infestation were appearing south of the St. Lawrence in Quebec, Maine, and New Brunswick. By 1951, severe infestation covered nearly 1·5 million acres in New Brunswick alone, and there was every indication that the heavy damage of previous outbreaks would be repeated unless control measures were undertaken. Aerial spraying commenced in 1952.

Prospects of severe outbreaks in Oregon and Washington were first apparent in 1945 [35]. By 1948, 1·5 million acres were affected and tree mortality had set in [100]. A successful trial of aerial spraying in Oregon in that year led to the initiation of large-scale control measures in 1949 [164]. Other outbreaks commenced in the northern Rocky Mountain region of Montana, Idaho, and Wyoming in 1948 and covered 2 million acres by 1953 [48].

In the regions concerned, the Spruce budworm has one generation a year and passes the winter in the first larval instar. Feeding commences in the spring, first by mining needles and unopened buds, and later by feeding in the growing shoots. The larval period extends over 6 to 8 weeks and pupation takes place in mid-summer. The moths emerge about 10 days later and oviposit in late July or August [41, 94]. Aerial spraying is most effective during the latter half of the larval feeding period when the insects are relatively well exposed to the insecticide. It is necessary to make the application while the larvae are exposed, before pupation, and preferably before serious feeding has occurred. The period is short and the timing of applications important.

OREGON-WASHINGTON OPERATIONS

Details of the history and organization of these operations up to 1952 have been described [100, 164, 167]. The decision to embark on a large-scale programme was made in 1948 after surveys showed that the outbreak was spreading and tree mortality had begun in the oldest infestation centres. A committee was formed representing Federal, State, and Municipal governments, and private organizations, with the following functions: (1) organization of annual co-operative aerial and ground surveys of the 49 million acres of forested land in the two States; (2) programme planning, based on survey results and established priorities; (3) equitable apportionment of costs according to land tenure. "A satisfactory cost-participation formula has been developed for these projects, which provides that public agencies pay the entire cost of treatment on publicly-owned lands; and that private owners pay 25% of the cost of treatment on their lands, another 50% being borne by the public agency primarily concerned, and the other 25% by the public agency having the secondary interest. In 1950 and 1951, the Oregon legislature decreed that private owners in Oregon should pay 37½% of the control costs and the State 37½%" [164].

The administration of most of these operations has been shared by the Oregon State Board of Forestry and the U.S. Forest Service. Technical supervision and studies of results have been undertaken by the Division of Forest Insect Research, U.S. Forest Service (formerly Bureau of Entomology and Plant Quarantine, U.S. Dept. of Agriculture). Contracts for supplying and transporting insecticide and for its aerial application have been given to private concerns submitting the lowest tenders.

Decisions on areas to be treated in the annual control plans have been based on the following considerations: (1) severity of attack and imminence of tree mortality within 1 or 2 years; (2) treatment of additional 'buffer zones' to minimize the possibility of reinfestation from adjacent areas; (3) advisability of protecting high-value Douglas Fir stands in western Oregon, regardless of degree of infestation. For administrative purposes the areas to be sprayed are divided into convenient 'units', each with its own spraying force, supervisory and servicing personnel, and operating from strategically located landing strips. The units are further sub-divided into spraying 'blocks' of 1000 to 5000 acres, defined by easily recognizable boundaries and assigned to individual spray pilots. Insecticide fs apportioned to each block at 1 gal./acre with an excess allowance of 1 to 10%. The chief pilots of each unit supervise the aerial application, and ground-check crews sample the spray coverage to locate missed or inadequately treated areas. Over-all supervision of spraying units is the responsibility of the Project Director with the assistance of operational and technical co-ordinators and a project inspection pilot.

A variety of aircraft has been used, including the Douglas SBD, Fokker, Martin TBM, Stearman (N3N, PT17, and N2S.3), Travelaire, Vultee BT-13 and Waco single-engined aeroplanes, and the Cessna T-50, Douglas B18, Douglas C47 and Ford Tri-Motor twin-engined aeroplanes. Of these, the Stearman types appear to have been most frequently used. Helicopters were also used to a limited extent but were found to be less economical and slower in operation. Except where commercial airports were available, temporary landing strips had to be constructed. These consisted of a single runway 1500 ft. in length, except in one case where separate landing and take-off runways of 1500 and 2000 ft. respectively were built. Thirteen Stearmans and 3 Bell helicopters were used to treat 161,000 acres, an average area of slightly more than 10,000 acres per plane. During the 1950 operations in Oregon, 41 spray aircraft covered 484,000 acres or an average of nearly 12,000 acres per plane. Spray equipment was calibrated for droplet size and rate of emission, and the distance between flight lines determined for the various types of planes.

The insecticide generally used on these operations is 1 lb. technical DDT dissolved in 1 quart of auxiliary solvent (napthalenic hydrocarbon) with sufficient No. 2 fuel oil added to give 1 U.S. gallon. For the 1951 operation only, the amount of DDT was reduced to $\frac{3}{4}$ lb./gal., but was increased to the usual dosage for subsequent operations when tests showed that somewhat less satisfactory control resulted.

Spray-block boundaries were defined and acreages determined from aerial photograph mosaics. The blocks were then assigned to spray pilots, who were briefed in the air by the chief pilots on the location of boundaries and recommended flight pattern. Aerial photographs were used by the pilots for flying and for recording coverage. Daily progress of the entire operation was plotted on composite maps at operational headquarters. Pilots were instructed to fly at 75 to 250 ft. above the trees, but it was necessary to allow some latitude on certain units owing to the rugged topography and differences in elevation of as much as 5000 ft. The usual procedure has been to fly successive lines along the contours, where possible, and to complete the coverage on the steep ravines by cross-patterning the slope on downhill flights. In most cases, spray planes operated singly under the periodic supervision of inspection pilots in observation aircraft, but in 1950 single-engine planes were flown experimentally in pairs. The second pilot followed in loose formation and thus needed no orientation flight. Another advantage noted was that if a plane was forced down, its location would be observed by the other pilot [167].

In 1949 and 1950, operations were generally suspended when wind velocities exceeded 6 m.p.h. and temperatures exceeded 68° F. Meteorological data were obtained by radio communication from weathermen situated at elevated points in the area. With this information as a guide, inspection pilots judged the suitability of conditions by observing the behaviour of the spray cloud. Most of the spraying was done in the early morning. During the 1950 operations, the number of hours of spraying in a day ranged up to 8 and averaged 4. Spraying was suspended after rains until the moisture had run off the foliage.

Operations were commenced when most of the larvae were in the fifth larval instar. Owing to differences in larval development there were considerable differences between units in the dates of commencing spraying. The total period of spraying ranged from 3 weeks for the relatively small 1954 programme in eastern Oregon to nearly 8 weeks for the large 1950 programme which involved units in both eastern and western parts of the State.

The method of measuring the effectiveness of the insecticide applications on these projects was to calculate the % reduction of larval populations from pre- and post-spray sample counts along assessment lines laid out in as many of the spray blocks as possible, i.e.

$$\text{Per cent control} = \frac{\text{Pre-spray count} - \text{post-spray count}}{\text{Pre-spray count}} \times 100$$

Sampling lines were laid out at right angles to the probable direction of flight lines and sampling stations located at intervals, usually 5 chains. Two 15-in. branch tips were cut from each of 5 trees per station, using long-handled pruners. Counts were made of living larvae by instars, about 2 days before spraying and 10 days afterwards.

The following standards of control were adopted for the project:

Excellent (98—100%) = Project average should fall in this range.
Good (95—97%) = Acceptable on blocks and occasional units.
Marginal (90—94%) = Acceptable on occasional blocks but not for units.
Poor (< 90%) = Unsatisfactory, re-spraying probably necessary.

and the actual control achieved is summarized below:

TABLE II

AVERAGE % MORTALITY IN SPRAY BLOCKS FOR ANNUAL OPERATIONS 1949–1954

Year	*Range for blocks*	*Project mean*
1949	88·9–100·00	97·6
1950	90·4–100·00	99·2
1951	74·0–100·00	98·6
1952	81·8–100·00	98·2
1953	88·5–100·00	99·1
1954	96·3–100·00	99·0

The problems of assessing mortality and the applicability of the above figures are further discussed in a following section.

According to the most recent reports the spraying operations to date are considered to have achieved highly successful results [11]. The epidemic in the high-value Douglas Fir stands of western Oregon has apparently been halted before it became lethal. A substantial reduction in the total area of infestation in the eastern Oregon Cascade region has occurred since the peak year of 1949 and tree-mortality has been restricted to $< 10{,}000$ acres. In general, reinfestation of sprayed areas has not been rapid or serious, so that $< 1\%$ of the 3,220,000 acres sprayed to date has had to be re-sprayed. Defoliated trees are reported to have shown 'remarkable' recovery following spraying. In addition to the protection of timber values at a reasonable cost, additional benefit has accrued through watershed protection and the averting of a serious forest-fire danger.

Since 1951, the Spruce budworm situation in Oregon and Washington has been further complicated by a rapidly intensifying outbreak of the Douglas Fir beetle (*Dendroctonus pseudotsugae*). By 1954, a total of over 5 million acres were affected by this insect, the most severe damage occurring in stands weakened by the budworm. In working out Spruce budworm control plans, consideration must therefore be given to the advisability of spraying stands threatened by the beetle at an earlier stage in the outbreak than would otherwise be necessary, in order to maintain their resistance.

A series of experiments in connexion with these operations was carried out each year from 1949 to 1952 [164]. The first was designed to test the effectiveness of spraying first-instar larvae at the time of emergence from the eggs in late summer. Of the 3 insecticides tested none gave satisfactory control. Toxaphene gave no appreciable control, BHC gave $< 25\%$, and DDT $< 50\%$. The second experiment showed the superiority of DDT over dieldrin and toxaphene during the late larval period. The amount of DDT in solution was also varied and it was suggested that $\frac{3}{4}$ lb. of DDT/gal. might provide adequate control with even distribution—a figure adopted for the 1951 operation only. Further tests of the effectiveness of lower DDT concentrations under operational conditions resulted in the use of 1 lb./gal. for subsequent operations. For the 1952 experiment, applications were made from 100, 150, 250, and 400 ft. above the trees. Good results were obtained in each case, suggesting that increased flying height might be warranted over rugged topography.

NEW BRUNSWICK-QUEBEC OPERATIONS

Eastern Canadian operations for 1952 to 1954 afford an interesting comparison with those in the western U.S.A. Both were against the same insect, although on different host species. By 1954, some 3·5 million acres had been treated in each region, with additional operations planned for 1955. Both have been over relatively remote and rugged areas and similar operational procedures were adopted. There were, however, some differences in conditions and methods used.

The Canadian spraying has been a co-operative undertaking by industry and government. The 1952 operation was undertaken on the initiative of one of the New Brunswick pulp and paper companies, costs being shared with the Province [21]. Following this, organization and direction in New Brunswick had been under a Crown corporation, Forest Protection Ltd., representing 4 companies and the Province, with costs shared equally by industry, the Province, and the Canadian Government [64, 65]. The programme across the Quebec border in 1954 was undertaken by Quebec Forest Industries Association, with costs divided between industry and the Province of Quebec [158]. The Forest Biology Division, Department of Agriculture, was responsible for surveys, scheduling operations, studying results, and providing other technical assistance [124].

During the 3 years, 8 operational bases have been constructed in New Brunswick forests and 1 in Quebec. An additional 4 have recently been built in Quebec for the 1955 programme. Each consists of landing and take-off runways 1500 to 2500 ft. in length, storage and loading facilities for aircraft fuel and insecticide, and accommodation for air and ground personnel.

Annual control plans were based on the results of aerial and ground surveys of defoliation and damage following each year's feeding and on surveys of egg populations during the late summer. Stands selected for treatment were those under severe attack for 3 or 4 years, in which Balsam Fir mortality was expected from next year's attack [159]. Areas selected for treatment were broken up into spray blocks by stereoscopic examination of aerial photographs, using natural features as boundaries. In 1953, these varied from about 2000 to 7000 acres and involved differences in altitude of up to 1500 ft. [53]. Operational boundaries were drawn between landing strips, and the spraying fleet was distributed according to the areas involved. Organization and direction of all operations was under the Project Director, assisted by a chief pilot and a chief ground supervisor. Area supervisors and inspection pilots controlled operations from each base.

Spray aircraft and pilots were obtained under contract to the project administration. It was possible to assemble a spraying force of considerable skill and experience, including participation in the Oregon–Washington operations. This undoubtedly contributed to the operational success of the project and to the outstanding safety record that was maintained. Apart from minor accidents on the runways, only one plane was completely destroyed in the 3 years and there were no fatalities or serious injuries. Stearman planes powered with Pratt and Whitney Wasp Junior 450-h.p. engines, fitted with boom and nozzle spray equipment, were preferred owing to their availability and proven suitability for forest spraying. In 1952, 20 Stearmans and one DeHavilland Beaver were used from a single airstrip. In 1953, 77 Stearmans operated from 6 strips and in 1954, 56 Stearmans from 7 strips. The 1955 programme requires 80 Stearmans using 6 bases in New Brunswick and 4 in Quebec.

Contracts for insecticide were also let by tender. The formulation used was a 12½% solution of technical DDT in a proprietary oil solvent, Picco Hi-Solv 473. The specifications called for a flash point of 180° F., sp. gr. of 0·95 at 60° F., low phytotoxic properties and the ability to withstand temperatures as low as — 30° F. without precipitation of the DDT. The latter was necessary to permit winter storage at the operational site [64].

Spraying procedures were similar to those used in Oregon. Inspection pilots flew pre-spraying orientation flights with spray pilots and inspected operations from observation aircraft. They judged the suitability of weather by reference to the behaviour of the spray cloud and meteorological observations on visibility, temperature, precipitation, and wind velocity from weather stations in fire lookout towers and airstrips [21, 160]. In 1952, pilots were assigned to spray blocks by lot and payment was on the basis of acreages treated. This involved inequalities in earning power owing to variable ferrying distances from the base. Subsequent improvements were made by basing payment on insecticide gallonage and in 1954 an adjustable scale was established by which the payment per gallon was based on a fixed ferrying distance of 10 miles; for distances greater or less than this, payment was adjusted by a fixed amount per mile. The average acreage treated per plane increased from about 10,000 acres in 1952 to 23,400 acres in 1953 and 26,100 acres in 1954.

In 1952, spraying was delayed until shortly after the peak of the fourth instar, when feeding was well advanced, and in spite of difficult weather conditions was completed by the commencement of pupation. This covered a period of 16 days, 7 of which were non-operational. A total of 35 operational hours was required. Spraying commenced as soon as light conditions permitted and continued until weather was unfavourable. Most was done in the early morning but about 20% in the evening. An efficient aircraft loading system contributed to the maximum utilization of the available time [53]. Six loading stations were provided, from which insecticide and fuel could be loaded simultaneously. The pilot loaded his own aeroplane, assisted by 2 hose handlers. Very seldom did aircraft have to wait for reloading, and they operated at an average rate of 2½ loads/hr., flying an average distance of 15·8 miles and carrying 126 gal./trip. Average time from landing through loading to take-off was 4·15 minutes.

An intensive ground check of spray deposit was made by distributing cards impregnated with an oil-sensitive dye, developed for the purpose, along assessment lines in all spray blocks [46, 64]. The average deposit reaching the ground below the trees, as measured by this method, was 0·36 gal./acre. Only 3·9% of the samples indicated a complete miss, and inadequately-sprayed areas were subsequently re-sprayed.

The 1952 operation led to the following results and conclusions:

1. Highly satisfactory coverage was obtained. Drift tended to compensate for limited accuracy in low-level navigation.

2. Intensive sampling showed that survival on sprayed plots was less than 1% of that on comparable, unsprayed plots (Table III); large flights of moths from adjacent, unsprayed areas, however, caused reinfestation in the next generation [24]. Such large-scale migrations of moths, associated with wind and convective air mass movements, are characteristic of eastern budworm outbreaks but have not been mentioned in connexion with the Oregon–Washington operations.

TABLE III

RESULTS OF AERIAL SPRAYING AGAINST SPRUCE BUDWORM IN NEW BRUNSWICK, 1952–54, UNDER VARIOUS CONDITIONS OF DOSAGE, SPRAYING HISTORY, AND FROST DAMAGE TO FOLIAGE. EGG MASSES INDICATE REINFESTATION IN FOLLOWING GENERATION

Year		Dosage gal./acre	% Population reduction: Total Range	Total Mean	Less natural control Range	Less natural control Mean	% buds killed by frost	% Foliage remaining: Sprayed	Unsprayed	Egg masses per 100 sq. ft. of branch surface: Sprayed	Unsprayed
1952	A	1	99–100	99·9	99–100	99·9	0	7	0	312	647
	B	½	99–100	99·4	75–100	87	78	—	0		
	C	½	99–100	99·8	98–100	99·3	10	48	0		
1953	D*	½	46–99·7	91·1	39–99	90	0	91	37	242	566
	E	½ (2 appl.)	99–100	99·7	91–97	93	81	6	0		
	F	½ (2 appl.)	99–100	99·6	93–99	97	35	4	0		
1954	G	½	88–100	97	0–100	65	0	52	0	217	473
	H†	½	92–99·9	97·5	79–99·9	93	0	83	61		

* Previously sprayed 1952. † Experimental plot sprayed 1952, 1953, 1954.

3. While application was timed to achieve maximum larval mortality, on plots sprayed first, larger amounts of current foliage were protected, in contrast to plots sprayed later, where current foliage was completely destroyed and some old foliage was also attacked [157].

4. At the high level of control achieved, no significant relationship could be established between measured dosage and mortality, suggesting that satisfactory control might have been obtained at lower cost using smaller dosages [64].

In 1953, techniques were revised with the following objectives: (1) to improve foliage protection by commencing spraying earlier and covering the area more rapidly; (2) to decrease cost per acre by using a minimum dosage and increasing the work done per plane; and (3) to ensure greater safety and improved coverage by flying planes in pairs [64]. Tests showed that without altering the calibration of the spray equipment, a good deposit could be obtained by flying at a lateral separation distance of 250 ft., with 150 ft. between adjacent flights. This doubled the average distance between flight lines and halved the dosage and flying time per acre [54, 65]. Spraying was commenced as soon as Balsam Fir shoots opened and most of the larvae became exposed to the contact effects of the insecticide [159]. A total of 1,800,000 acres was treated, 400,000 acres of which received 2 treatments, 7 to 10 days apart. Cost per acre was less than half that in 1952 (Table I).

Essentially the same techniques were used in 1954 with further improvements in timing. Spraying was not recommended until some 25% of the larvae were in the fourth instar, since spraying as early as the peak of the third instar in 1953 had made some re-spraying necessary. Differences in foliage development in various parts of the operational area were detected by means of low-level flights in observation aircraft. An additional modification was made in the scheduling of individual blocks. This involved spraying alternate blocks first and returning later to complete the coverage, in order to take the maximum advantage of drift affecting adjacent blocks [159]. The total area of 1,100,000 acres was given a single application.

Studies have been made each year of the immediate effects of the spraying on insect numbers and on the amount of defoliation. At the same time long-term studies have been undertaken on effects on the epidemiology of the pest and the growth and survival of the trees. A system of study plots was established in areas of different infestation and spraying history, and in unsprayed check areas. Sample counts of the budworm populations were made periodically throughout the season on permanent plots, and mortality was estimated by methods described later under *Assessment of results*. Extensive sampling surveys of egg population and aerial surveys of defoliation were used to determine degrees of foliage protection and reinfestation over wide areas.

Some of the data on immediate results are summarized in Table III. They serve to illustrate some of the difficulties in measuring results of large operations complicated by differences in treatment and forest conditions. Studies are possible only at a few representative locations and the data are of limited significance for the total areas involved. They are, however, indispensable for gauging the efficacy of the insecticide and for giving guidance on techniques of application. The high insect mortality but low foliage protection achieved by the relatively late spraying at 1 gal./acre in 1952 are clearly shown in the table. Variable results were obtained in 1953 at a single application of ½ gal./acre, owing to the effect of late frosts. Where this was severe, as in B, the destruction of remaining new shoots by young larvae was rapid and mortality from starvation high; thus fewer shoots survived and the proportion of the insect mortality due to the spray alone was less [24]. Where frost damage was not severe, as in C and D, the proportion of total mortality attributable to spraying was higher and good foliage protection resulted. The unusually high foliage protection in D resulted from re-spraying an area previously treated in 1952 on which good foliage recovery had occurred (shown by the fact that 37% of the new foliage remained on similar areas not re-sprayed in 1953). Areas receiving 2 applications in 1953 about 3 weeks apart showed low insect survival but also low foliage protection, the latter owing partly to the effects of frost and partly to the fact that areas selected for a double application were those suffering most severely from previous defoliation. The 1954 results are not complicated by frost and show the effects of improved timing in protecting foliage. In this case, the relatively low percentage reduction of insects due to spraying alone resulted from comparison with a check area on which natural mortality from starvation was unusually high [160, 161]. Example H shows the effect of spraying an experimental plot for 3 years in succession. The data on egg populations of the next generation were obtained from extensive surveys of all sprayed and unsprayed areas. Reinfestation in all cases resulted both from surviving populations and from large invasions of moths.

The results of the 3 years' operations to date have been summarized as follows: "The spraying has kept alive large areas of forest that, judging from the check areas available, would almost certainly now be in a dying condition. It has brought about a very definite improvement in the condition of the trees the year following spraying. In general, this seems likely to be maintained for 2 years after spraying. Thus, protection has been given for a period of 3 years, after which re-spraying may be necessary if the outbreak continues. The ultimate success and cost of the project depends on the length of the outbreak. It commenced in 1949. The previous outbreak lasted 10 years but it cannot be assumed that this one will be similar, especially as little is yet known of the effects of such a large-scale operation on the epidemiology of the insect" [160].

A series of aerial and ground tests were made in connexion with the 1953 operation to determine the relative toxicity of DDT, BHC, and organic phosphate in various solvents. DDT gave the best results, organic phosphate was somewhat less effective, and BHC unsatisfactory. Solvents alone, dispersed from aircraft, gave some evidence of reducing populations, probably due to an irritant effect causing the larvae to drop from the branches [56].

To be concluded.

ABSTRACT SECTION

0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general *regional* accounts see section 90

Translations:

See Nos. 733, 806–7, 823, 829, 927, 971, 983, 1009, 1012–4.

0 (02). Handbooks. Manuals. Textbooks

1. JAMES, N. D. G. **The forester's companion.** Basil Blackwell, Oxford. 1955. pp. xiv + 312. Price 12*s*. 6*d*.

A pocket-sized book, containing the following chapters: forest trees grown in Britain; nursery work; preparations for planting; planting and establishment; the tending of woods and plantations; silviculture; coppice and underwood; forest management; timber measuring; the elements of forest surveying; forest protection; diseases and pests; forest roads and rides; felling, extraction, and transport; sawmills and conversion; utilization; timber seasoning and preservation; the valuation and sale of timber; gates and fencing; hedges and shelterbelts; arboriculture and amenity planting; forestry and shooting; trees and the law; financial assistance, felling licences, and taxation; the Forestry Commission; societies concerned with forestry and trees; forestry departments and organizations; botanic gardens, arboreta, and forest parks; forestry education; forestry books and periodicals; a calendar of forestry work; index.

0 (038). Dictionaries

See Nos. 8, 69–70, 1030.

0 (043). Theses, Dissertations

2. REIDY, G. L. [Compiler]. **Graduate theses 1944–1954 [of the College of Forestry, State University of New York].** State College of Forestry, Syracuse, N.Y. 1955. pp. 116.

Contains brief abstracts of 150 theses accepted during the period, in the sections: forest botany and pathology; forest chemistry, pulp and paper technology; forest economics, forest management; forest entomology; forest utilization; forest zoology; landscape engineering, recreation management; silviculture; and wood technology. An appendix lists titles of graduate theses 1914-1943. There is a combined author and subject index.

0 (048.1). Bibliographical Lists

See also Nos. 175–6, 240–1, 529, 992, 1096.

3. Bibliographie des ausländischen forst- und holzwirtschaftlichen Schrifttums: Folge 8 enthält Titel der Jahre 1952/1953. **[Bibliography of foreign literature on forestry and wood utilization: No. 8—titles of 1952–53.]** *Mitt. Bundesanst. Forst- u. Holzw.* No. 36, 1954. pp. xvi + 319. [G.]

4. Bibliographie des ausländischen forst- und holzwirtschaftlichen Schrifttums. Neue Folge. **[Bibliography of foreign literature on forestry and wood utilization. New Series.]** Bundesforschungsanstalt für Forst- u. Holzwirtschaft, Reinbek bei Hamburg. [G.]

From the present number (Vol. 1, No. 1, 1955) it is intended to publish this bibliography more frequently (eventually 6 times annually). A list of periodicals and serials and an author index will be provided annually. [Individual issues will therefore not be noticed separately in *For. Abstr.* in future.]

0 (05). Periodicals. Yearbooks. Directories. Almanacs, Calendars, Diaries

See also Nos. 325, 489, 749–50, 1084.

5. ***Nyasaland Farmer and Forester.*** Agricultural Department, Zomba.

Succeeds *Nyasaland Quarterly Agricultural Journal.* Vol. 1, No. 1, in the new form was issued in April, 1953. Citation in *For. Abstr.*: *Nyasld. Fmr. For.*

6. ***New Zealand Forestry Research Notes.*** New Zealand Forest Service, Wellington, N.Z.

This new series takes the place of the *Forest Research Notes* [1 (1)–1 (12)] and the *Forest Products Research Notes* [1 (1)–1 (5)], and will report research carried out in New Zealand in all fields of forestry. Citation in *For. Abstr.*: *N.Z. For. Res. Notes.*

7. ***New Zealand Timber Journal.*** R. Hill and Son Ltd., Union House, Quay St., Auckland, C.1. Monthly. Price 25*s*. p.a. (single copy 2*s*.)

Vol. 1, No. 11, for June, 1955, contains some 77 pages, mainly devoted to the Tasman Pulp and Paper Co. project. Citation in *For. Abstr.*: *N.Z. Timb. J.*

0 - - 011. Terminology. Nomenclature

See also Nos. 69–70, 160, 769, 1030.

8. **Provisional Arab forestry terminology.** FAO Near East Regional Office, Cairo. 1955. pp. 174. [E.F.Arab.]

Gives 984 definitions (in Arabic) arranged in alphabetical order of English words, with French equivalents appended. There are also indexes of French and Arabic words. The present edition invites criticisms and amendments, which will be incorporated in a second edition.

1. FACTORS OF THE ENVIRONMENT. BIOLOGY

11. Site Factors: Climate, Situation, Soil, Hydrology (Water Conservation, Soil Conservation and Erosion)

111. The Atmosphere. Meteorology. Climate and Microclimate

111.1. Composition, Structure, Mechanics and Thermodynamics of the Atmosphere in General

9. HYDE, H. A. **A census of atmospheric pollen and its possible applications.** *Proc. Linn. Soc., Lond.* 165 (2), 1955 (107–12). 7 refs. O.B.D.

Presents data from collections made by the gravity-slide method at Cardiff and 12 other stations in Great Britain over the years 1943–47, and discusses the uses of such data.

111.5. Wind

See No. 504.

111.7. Humidity, Evaporation. Clouds etc. Precipitation

See also section 116.

10. AHMAD, S.-U.-D. **Dew investigations in Pakistan.** *Pakistan J. For.* 5 (1), 1955 (33–6). 7 refs.

Describes an apparatus devised by the author for collecting and measuring dew in liquid form.

111.8. Climatology. Climate and Microclimate

See also Nos. 196, 232, 398, 432–5, 624, 716, 719–20.

11. MILLER, D. H. **Landscape and climate: the influence of open Pine forest on daytime temperature of the Sierra Nevada.** *Abstr.* in *Bulletin of the Geological Society of America, Baltimore* 65 (12), 1954 (1396–7). L.S.

A salient feature of the local climates that develop in the Sierra Nevada of California between winter and spring snowstorms, is the marked day-time warmth manifest in an air temperature of 50° F. or higher and in high rates of snow melt. This high day-time energy level results from absorption of strong insolation by the dark elements of the natural landscape—the Lodgepole Pine stands, which cover about 40% of the surface. Stands are open, and the edge effect is dominant, so that more than half of the intense short-wave radiation is absorbed. Foliage is heated as much as 20° F. above air temperature, and large amounts of latent heat are transferred therefrom to the surrounding air. Passage of this heat into air trapped between concave topography below and a subsidence inversion aloft results in the observed anomaly of day-time temperature.

12. TURNOCK, W. J. **A comparison of air temperature extremes in two Tamarack sites.** *Ecology* 36 (3), 1955 (509–11). 1 ref. [Forest Biology Laboratory, Winnipeg.]

Differences in the maximum and minimum temperatures at 4½ft., recorded during the summer of 1953 between a stand of pure *Larix laricina* (*a*) and an adjacent mixed stand of *L. laricina* and *Picea mariana* (*b*), could be attributed to differences in the foliage and crown characters of the two species. While the Tamarack was leafless or only partially foliated, mean maximum temperatures were 1–2° higher in (*a*) than in (*b*); when the Tamarack was in full foliage the mean maxima and minima were 1–2° higher in (*b*) than in (*a*). Partial defoliation of the Tamarack by Larch sawfly after 20 June made no difference to mean maximum temperature, but reduced the mean minimum temperature of (*a*) to 1–2° below that of (*b*).

13. GREGORY, R. A., and JAMES, G. A. **The effect of clear-cutting on air and soil temperatures in southeast Alaska.** *Tech. Note Alaska For. Res. Cent.* No. 23, 1955. pp. 2. 1 ref.

Records of air and soil temperatures in clear-felled and undisturbed areas in the summers of 1952–54 show consistently higher maximum temperatures in the open, the monthly differences for the air ranging from 1·9 to 8·6° F., and for the soil from 3·4 to 13·4°. Air and soil minima were less affected by clear felling.

14. ANDERSEN, H. E. **Climate in southeast Alaska in relation to tree growth.** *Sta. Pap. Alaska For. Res. Cent.* No. 3, 1955. pp. 5 + 2 tbls. + 3 maps. 11 refs.

Presents data on the climatic factors most critical for tree growth (precipitation, mean temperatures during the growing season and the 3 coldest months, and the number of frost-free days), with a brief general discussion on climate and growth. Heavy rainfall and low temperature in the growing season are probably the chief limiting factors.

15. THORNTHWAITE, C. W., and HARE, F. K. **Climatic classification in forestry.** *Unasylva* 9 (2), 1955 (51–9 + map). 18 refs.

Expounds the first author's classification of climates, based largely on potential evapotranspiration, and attempts to correlate it with the forest types of the U.S.A. and (more closely) with the vegetation of the boreal forest.

114. Soil. Soil Science

16. **Sampling procedures and methods of analysis for forest soils.** College of Forestry, University of Washington, Seattle. 1953. pp. 38 + 4 dgms.

A manual prepared by the Forest Soils Committee of the Douglas Fir Region. Covers sampling and physical and chemical analysis.

114.1. Soil Physics

See also Nos. 13, 16, 28–9, 42, 61–2, 120, 222, 393–4, 676, 705.

17. TROEDSSON, T. Vattnet i skogsmarken: studier med hänsyn särskilt till ytvattnets, sjunkvattnets och grundvattnets uppkomst och sammansättning. **[Water in forest soils [in Sweden]: studies with particular reference to the occurrence and composition of surface water, seepage water and groundwater.]** *Skr. K. Skogshögsk., Stockh.* No. 20, 1955. pp. 215. 7 pp. of refs. [Sw.g.]

18. PASSARGE, H. Örtliche Beobachtungen über jahreszeitliche Schwankungen des Grundwasserstandes. **[Local observations on seasonal variations in the water-table.]** *Arch. Forstw.* 3 (5/6), 1954 (475–86). 9 refs. [G.g.]

Conclusions from the measurement of water-table levels (w.t.) in pits dug on forest sites were: the w.t. and its variation can be quite independent of levels of open water (streams etc.) in the immediate vicinity. In forest soils the w.t. is normally highest at the late winter thaw (Feb.–Mar.) after which it gradually sinks during the growing season to its lowest point in Sept.–Aug. This cycle is subject to wide fluctuations. In the frost-free period, rainfall (or, more accurately, infiltration) produces variations, and similar ones are set up in the frost period from a rise in temperature preceding a thaw. Seasonal fluctuations, and even more the over-all range in w.t., are very closely dependent on the nature of the gley horizon. The seasonal variations of w.t. in permeable sands give a fairly undistorted picture of the seasonal differences in storage. In them the over-all range of w.t. is ca. 50 cm. Peats, with their greater holding capacity, actively raise the w.t., which sinks less in summer. The total variation of w.t. is a few cm. for fibrous peats poor in fine humus, and a few dm. in peats rich in fine humus. Clayey layers sharpen the contrast between high and low w.t. by impeding the groundwater as it rises as well as when it sinks. Where there are relatively high variations, the over-all range of which usually rises with clay content, there is generally a distinct lag in seasonal course of the fluctuations.

19. TJULIN, A. F. Voprosy počvennoĭ struktury v lesu. (O sezonnoĭ izmenčivosti v lesnyh počvah vodopročnyh agregatov na primere izučenie temnoseryh lesnyh počv Tellermanskogo lesničestva.) **[Problems of soil structure in the forest: the seasonal variation of water-stable aggregates in forest soils, illustrated by research on grey forest soils in the Tellerman Forest.]** *Počvoved.* 1954 (1), (30–44). 24 refs. [Russ.] [Institut Lesa Akademii Nauk SSSR.] A.P.B.

In previous researches on agricultural soils the author distinguished two groups of water-stable aggregates (w.s.a.): I—occurring outside the zone of direct action by fine living roots and micro-organisms of the rhizosphere; these aggregates are broken down to their mechanical elements by the Na ion in neutral NaCl solution and are stated to be formed by Ca humates; II—occurring in that zone; these can only be broken down completely by dilute alkali (e.g. NaOH) or mechanical dispersion, and are said to be formed by Fe humates. The micro-aggregates of II have a marked capacity for self-aggregation to form w.s.a. $\geqslant 0{\cdot}2$ mm. The actual w.s.a. in the soil are said to be mixtures of the two groups, which, on the basis of later work on forest soils, are regarded as interconvertible under certain conditions (relative activity of roots and micro-organisms, hydrothermal régime of the soil, oxidation/reduction conditions).

The author describes in some detail his new simplified method ('fractional peptization') for the determination of these groups, expressing their contents in terms of the particle-size range $< 0{\cdot}01$ mm., representing the breakdown products of the actual w.s.a. Two soil samples (*a*, *b*) of equal weight (5 or 10 g. according to soil type) are taken:

Sample (*a*) is leached with *N* NaCl solution until free of the Ca ion, and then subjected to repeated cycles of cautious agitation in water, standing, and siphoning off of the supernatant liquid (discarded unless required for determination of its humus content), until the liquid shows marked clearing. Times of standing and depths of siphoning are tabulated against temperature (Stokes' law). Any marked mechanical action must be carefully avoided throughout, to prevent mechanical dispersion of II. The soil residue is then oven-dried and weighed to get the content of I by difference of initial and final weights.

Sample (*b*) is moistened to a paste and subjected to cycles of grinding for 3–4 min. with a rubber pestle, agitation in water (decanted with its suspended matter after standing 5 min.) and re-drying to pasty consistency, repeated until marked clearing of the supernatant liquid occurs. The combined content of I and II $< 0{\cdot}01$ mm. is determined for the suspensions.

The content of II is obtained by the difference $(\mathrm{I} + \mathrm{II}) - \mathrm{I}$. Strictly speaking, the figure here obtained for I includes any matter peptized by water as well as by NaCl, but for many non-saline, carbonate-free soils, especially chernozems, the error is not significant.

Using this technique, tests were made on the same soil samples as those used for C, N and P determinations in the author's work in 1952 on grey forest clay-loams under Oak in the Tellerman Forest [see *For. Abstr.* 15 (No. 2330); 16 (No. 212)]. In the topmost 3–13 cm., immediately beneath the humus layer $\mathrm{II} > \mathrm{I}$ during the whole growing season, the curves showing opposite trends, with II maximum and I minimum in August. The increase of II to its August peak is perhaps due to the increase in living roots (largely of herbs, e.g. *Aegopodium*), and its subsequent decline to their death and rapid decomposition, which might bring about reduction of ferric to ferrous (more soluble) compounds, with breakdown of II and re-aggregation to I. At 20–30 cm., $\mathrm{II} < \mathrm{I}$ during the whole growing season except Sept.–Oct., the preponderance of I being ascribed to the relative absence of fine roots at this level. The trends of the curves for the groups were again opposite, i.e. the sum of the two groups showed little variation; but, in contrast to the top soil, II declined to a July minimum, then rising steadily until Oct. and dropping sharply in Nov. This may be connected with differences in moisture and aeration: June–July rains kept the soil moist in early summer, and II were presumably converted to I in more or less reducing conditions; but with later drying of the soil, increased availability of O_2 at 20–30 cm. should favour root activity and an increase of II, the Nov. drop being attributable to the autumn rains. A plot kept free of roots showed scarcely any seasonal variation for either group; its very high % of II was probably a result of the method of preparing the plot.

Kuznecova, working on grey forest soils under Birch in Siberia, with a rainy late summer, found that II decreased at that season and increased in autumn and towards the start of the next growing season. Kozlova, for agricultural soils near Moscow, showed an increase of II in the dry summer as compared with the moist spring.

The differences found by this method are not detected by the ordinary method of analysis based on the single criterion of water-stability.

20. TJULIN, A. F. Voprosy počvennoĭ struktury v lesu. (O mehanizme nakoplenija gumusa v počve pod lesom.) [**Problems of soil structure in the forest: the mechanism of humus accumulation in soils under forest.**] *Počvoved.* 1955 (1), (33–44). 20 refs. [Russ.] [Institut Lesa Akademii Nauk SSSR.] A.P.B.

Briefly expounds the author's views on the genesis in forest soils of two groups of w.s.a. [see preceding abstract], with some additional information (including mention of the fact that the temporary decrease of N and P in the upper soil during the early part of the growing season has now been observed for 4 successive years with different weather in the Tellerman Forest, and also, in 1954, in Tula). Direct measurements [no details given] showed that in the upper layer of forest soil E_h is $\not>$ 350 mv., and when the O_2 consumption of plant roots is high, or the litter moisture-saturated, it may drop to 260 mv. or lower. Data for ploughland (from literature) often show E_h values of 500–600 mv. At low E_h, group-II aggregates are said to break down and their substance to become more accessible to micro-organisms, so losing part of their N and P. Previous analyses showed that I were poorer in humus, N and P, than II. During the mineralization of plant remains, re-aggregation to I is believed to occur owing to the presence of Ca cations in the soil solution. Further data from the Tellerman Forest in 1953 confirm that the total content of w.s.a. remains more or less constant through the season, whereas the ratio I/II varies very widely in the 20–30-cm. soil layer (from ca. 41 in July to 1–2 in Aug.–Sept., 12 in Nov., 18 in May and 6 in June), though in the 3–15-cm. layer it ranged only from 0·63 to 2·0. Soil moisture determinations during the season are tabulated: they show that a May fall in the content of II at 20–30 cm. may be due to high litter moisture and so decreased availability of O_2, especially as the O_2 requirement of roots in the upper soil is then high. The low to very low content of II in the lower soil in June–July, when the litter was comparatively dry, is perhaps due to active root growth.

Accumulation of humus in the upper layers of forest soils is attributed to (*a*) the predominance of II at that level, and (*b*) the high humus content of II. Data from the Tellerman Forest show that II contained 1½—2 times as much humus as I, and ca. 10 times as much as particles > 0·01 mm. Figures for the A_1 horizon of broadleaved forest soils in 5 different regions show ratios of I/II varying from 0·05 to 0·53, except in the Tellerman Forest (0·93) where the soils have pH 7·2–7·4. Data from Tula are quoted to show that the content of II soon decreases when forest soil is ploughed and put under vegetable crops. It is believed that in the markedly aerobic conditions of ploughed soil both II and I are less stable, and that this explains the deterioration of structure in ploughed soils. Finally, data are given from the Tellerman Forest, showing that the content of II dropped from 31% at 3–15 cm. to 6·4% at 30–40 cm. and to nil below that level, whereas that of I simultaneously increased from 30% at 3–15 cm. to 62% at 110–120 cm. It seems probable that w.s.a. of group II are important in locking up nutrients which are again released on their breakdown.

21. KUNDLER, P. Zur Anwendung der Invertzuckermethode für standortskundliche Temperaturmessungen. [**The use of the invert-sugar method for site temperature measurements.**] *Z. PflErnähr. Düng.* 66 (3), 1954 (239–46). 10 refs. [G.g.] O.R.S.

A method developed in Switzerland in 1940, using ampoules containing an acid sucrose solution, was found accurate in determining mean temperature of the air at ground level and of the soil in forest sites in the N. German plain. A detailed account of the experiment and its results will be published elsewhere.

114.2. Soil Chemistry

See also Nos. 16, 19–20, 25–7, 30–7, 42–4, 220, 222, 705.

22. SPAUSZUS, S., and HORBACH, I. Über eine massanalytische Bestimmungsmethode von Barium bei der Ermittlung der Sorptionswerte forstlich genutzter Böden. [**A method for the volumetric determination of barium during the estimation of the base exchange capacity of forest soils.**] *Z. PflErnähr. Düng.* 64 (3), 1954 (238–44). 4 refs. [G.g.] O.R.S.

23. THEMLITZ, R. Über die Phosphorsäuresorption durch das Tonmineral Nontronit, besonders bei stärkerer Entbasung, und die Ausnutzung sorbierter Phosphorsäure durch Kiefernsämlinge. [**The sorption of phosphoric acid by nontronite, especially with low base saturation, and the utilization of the sorbed phosphoric acid by Pine seedlings.**] *Z. PflErnähr. Düng.* 59 (3), 1952 (216–35); 60 (1), 1953 (1–21). 45 refs. [G.g.] O.R.S.

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also Nos. 18–20, 39, 48–9, 52, 54–6, 59, 222, 403, 705, 710.

24. BASILEVIČ, N. I. Osobennostĭ kruglovorota zoljnyh èlementov i azota v nekotoryh počvenno-rastiteljnyh zonah SSSR. [**Characteristics of the cycle of ash elements and N in some soil/vegetation zones of the U.S.S.R.**] *Počvoved.* 1955 (4), (1–32). 71 refs. [Russ.russ.] A.P.B.

A survey of data from literature (almost all Russian) to illustrate, in broad outline, the interacting roles of vegetation and soil in the turnover of the main nutrient elements in the various zones, e.g. northern coniferous forest, broadleaved forest, steppe, desert, and halophytic vegetation.

25. ZEMLJANICKIĬ, L. T. Izmenenie kaštanovyh počv pod vlijaniem lesnyh nasaždeniĭ. [**Changes in chestnut soils under the influence of tree plantations.**] *Lesn. Hoz.* 5 (11), 1952 (67–72). [Russ.]

Gives an account of studies on chestnut and associated soils under shelterbelts (Oak with species such as *Acer tataricum*, *A. negundo*, *Fraxinus* spp., *Caragana arborescens*, *Robinia pseudoacacia*, *Rhus cotinus*) in Rostov Province, comparing soil conditions in 1937, when the plantations were 5 years old, with those in 1949. In general, the shelterbelts had little or no effect on the gross morphological character of the soils, but analyses of aqueous soil extracts showed lower values in 1949 for dry residue, total alkalinity, Cl and SO_4 (tabulated in % of oven-dry soil). This effect—an improvement in a region where saline and alkaline soils tend to develop—is attributed largely to the increased leaching by melting snow accumulated in the shelterbelts. It was not observed in some belts which were in poor condition owing to unsuitable choice of species or depleted by cutting. Notes are appended on the structure of similar soils in two abandoned nurseries with pure groups of various species, with table of % distribution of water-stable aggregates, and Oak, *A. tataricum* and *R. cotinus* are said to be especially valuable in bringing about the formation of large water-stable aggregates.

26. CROCKER, R. L. and MAJOR, J. **Soil development in relation to vegetation and surface age at Glacier Bay, Alaska.** *J. Ecol.* 43 (2), 1955 (427–48 + 4 photos). 13 refs.

The development of certain soil properties, in relation to the broader features of vegetation dynamics and as a function of time, has been studied in the extensive recently deglaciated areas of the eastern shores of Glacier Bay, Alaska. The physical nature of glacial till makes it a difficult medium for studies of this type, but it has been possible to demonstrate a number of interesting effects of plants on soil formation. In the pioneer stages of succession, as the rate of change in soil properties is dependent upon the actual micropattern of plant colonization, the accidents and factors of dispersal and establishment are highly significant. The areal pattern of soil properties is very variable at this stage. The more or less continuous development of the Alder [*Alnus crispa*] thicket leads to greater uniformity. Under Alder the reaction of uppermost horizons of the glacial till is reduced from pH 8·0 to less than pH 5·0 within 35–50 years. During the same period $CaCO_3$ in the fine earth is reduced from initial values of the order of 5% to negligible quantities. Under other species, the rate of change is much less, and on areas devoid of vegetation, less still. Within 40–50 years, 5–6 kg./sq.m. of above-surface organic residues, 6–7 cm. deep, with pH 4·2–4·6 accumulate under Alder. The 18 in. (45 cm.) deep mineral-soil profile and forest floor combined have accumulated almost 4·0 kg. of organic C and 0·3 kg. of N per sq. m. beneath 50-year-old Alder. The *Dryas* mat is also capable of accumulating considerable quantities of N, but not nearly so effectively as Alder. Significant N accretions also occur in the absence of macroscopic vegetation. The chronosequence as a whole covers the main phases in vegetation changes from the initial colonization of the bare surfaces to the establishment of the Spruce(*Picea sitchensis*)-dominated forest. The changes in the mineral-soil properties of bulk density of the fine earth, reaction, organic C, $CaCO_3$ and total N are traced, and related to broad vegetation change. The amount of forest-floor material, its reaction, and its C and N contents were also determined. An absolute loss of N from the mineral-soil/forest-floor system is recorded with the elimination of Alder and the emergence of the Spruce forest. C/N ratios for the upper mineral soil and forest floor increase from the order of 12–16 to > 30 over this stage. Organic C increases throughout the whole sequence. Soil pH declines rapidly at first but apart from a downward extension of acidity does not change much after the Alder thicket stage. The bulk density of the fine-earth fraction of the surface horizon appears to fall throughout, but is more significant during the early stages. *From authors' summary.*

27. SCOTT, D. R. M. **Amount and chemical composition of the organic matter contributed by overstory and understory vegetation to forest soil.** *Bull. Yale Sch. For.* No 62, 1955. pp. 73 + 2 plates.

A review of the literature (17 pp.) precedes an account of an experiment conducted in Connecticut to determine the relative importance of tree species and subordinate forest vegetation in producing litter. The experimental area was in the transition zone between the Oak/Hickory and Beech/Birch/Maple types, and also included pure stands of *Pinus strobus*. The species composition of the subordinate forest vegetation is indicated in a checklist. In all circumstances tree species (*a*) produced more litter than did the subordinate vegetation (*b*) which averaged only 15% of the total annual weight of litter. Hardwood types produced more litter (average 1842 lb./acre/year) than the White Pine type (average 1480 lb.). It appeared that the amount of (*b*) was controlled more by available moisture and density of the upper canopy than by the species composing it. Weight of annual litter fall from (*a*) varied appreciably from year to year, but that from (*b*) was relatively constant. Details are given of variation between litter from (*a*) and from (*b*) in content of K, Ca, Mg, P, Mn, Fe, Al, Zn, Na, Cu, B, and N, and H-ion concentration. The evidence strongly indicates that litter of (*b*) may play an important role in the general nutrient cycle since it contains higher concentrations of many nutrient elements than that of (*a*) (e.g. twice as much K, Cu and N, and 3 times as much Al), so that its influence must be greater than its proportional weight would indicate.

28. KITTREDGE, J. **Some characteristics of forest floors from a variety of forest types in California.** *J. For.* 53 (9), 1955 (645–7). 8 refs.

Tabulates data for the organic material above the mineral soil in dry tons/acre, its depth, and bulk

density in plantations of *Pinus radiata*, *P. canariensis*, *P. pinaster*, *Cedrus deodara*, and *Sequoia sempervirens* and the same factors plus field moisture capacity, for 11 mature and immature natural types (Firs, Pines, *Sequoia*, Oak, and grass) ranging from 700 to 6500 ft. *P. radiata* and *P. canariensis* plantations had as much forest-floor material at 40 years as natural mature Fir and Pine. All plantation floors were ample protection against accelerated erosion. Bulk density varied from 0·05 to 0·08; field moisture capacity from 150 to 206% (245 under grass).

29. KITTREDGE, J. **Litter and forest floor of the chaparral in parts of the San Dimas Experimental Forest, California.** *Hilgardia, Berkeley* 23 (13), 1955 (563–96). 17 refs.

Samples of the accumulation of litter were collected annually from 1935 on different types of chaparral. The results of their study are given in terms of variation in crown cover, depth, and weight of litter with age, species, and type, field moisture capacity, effect of fire, and annual loss by decomposition.

30. DELONG, W. A., and SCHNITZER, M. **Investigations on the mobilization and transport of iron in forested soils: I. The capacities of leaf extracts and leachates to react with iron.** *Proc. Soil Sci. Soc. Amer.* 19 (3), 1955 (360–3). 11 refs. O.R.E.

Experiments with aqueous solutions from leaf extracts, canopy-drip solutions, and forest floor and A-horizon leachates of *Populus grandidentata*, *Fagus grandifolia*, *Betula populifolia*, *Acer saccharum* and *Pinus strobus*, nearly all growing on podzol soils, are described. They showed that the capacity to retain Fe in solution, and to bring the Fe of freshly precipitated $Fe(OH)_3$ into solution, tended to increase with increasing pH, depended on the dominant cation and the Fe/organic-matter ratio, and was, at pH5, greater for all leachates and canopy drips (with the exception of *P. strobus* drip) than for *P. grandidentata* leaf extract. Results of an investigation into the mobilization of Fe and Al from the A_2 and B_2 horizons of two podzols and one grey (wooded) soil by Poplar leaf extract showed similar results to earlier tests with Beech and Maple. [Cf. *For. Abstr.* 16 (No. 1351).]

31. SCHNITZER, M., and DELONG, W. A. **Investigations on the mobilization and transport of iron in forested soils. II. The nature of the reaction of leaf extracts and leachates with iron.** *Proc. Soil Sci. Soc. Amer.* 19 (3), 1955 (363–8). 13 refs. O.R.E.

Electrodialysis of Poplar (*Populus grandidentata*) leaf extracts enriched with Fe indicated that the major part of the Fe was present either as $Fe(OH)_3$ or in a form readily convertible to the latter. Fractions isolated from Poplar leaf extracts and leachates by precipitation in 80% aqueous ethanol possessed the major part of the capacities of these solutions to react with Fe. The principal component had the characteristics of an acidic polysaccharide. An environment dominated by Na-ions is more favourable to the mobilization of Fe than one in which Ca-ions predominate, and the latter is more favourable than one in which H-ions predominate.

32. BLOOMFIELD, C. **Effects of leaf extracts on soil constituents.** *Rep. Rothamst. exp. Sta. 1954*, 1955 (59).

Continuing work on the soil-forming properties of leaf leachates, the author has obtained further evidence for the operation of an inhibiting factor in the reaction between Fe_2O_3 and an Aspen-leaf extract [cf. *For. Abstr.* 15 (No. 2215)]. Several constituents of Aspen-leaf and Scots-Pine-needle extracts have been identified, but so far it has not been possible to relate these to the action of the extracts on Fe_2O_3.

33. **[Papers read at a conference on organic substances in the soil, held at Brunswick-Völkenröde, March/April 1954.]** *Z. PflErnähr. Düng.* 69 (1/3), 1955 (1–255). [G.,E., or F.] O.R.S.

Papers include the following, all in German: Lignin and its formation in plants (*K. Freudenberg*; pp. 1–2; 3 refs.); The chemistry of natural tannins (*O. T. Schmidt*; pp. 15–25; 15 refs.) The question of lignin/carbohydrate linkage in wood (*H. Richtzenhain*; pp. 25–32, 15 refs.) Compost humic acids from various plant ingredients (*U. Springer*; pp. 66–71, 4 refs.) Humic acid from various soil types (*K. Nehring*; pp. 71–86; 6 refs.) Chemical studies on humus from various Spanish soil types (*J. M. Albareda*; pp. 86–93; 10 refs.) Lignin degradation and phenoloxydase formation by soil hymenomycetes (*G. Lindberg*; pp. 142–50; 33 refs.) The breakdown of pectin (*K. T. Wierringa*; pp. 150–5; 6 refs.) Enzymes and humus formation (*E. Hofmann*; pp. 165–72; 9 refs.); and Microfauna and humus formation (*H. Franz*; pp. 176–81; 19 refs.)

34. SPRINGER, U., and WAGNER, A. Über Komposthuminsäuren aus Zersetzungsrückständen landwirtschaftlich und forstwirtschaftlich wichtiger organischer Stoffe. **[Compost humic acids from decomposition products of important agricultural and forest organic materials.]** *Z. PflErnähr. Düng.* 64 (3), 1954 (259–76). 7 refs. [G.g.] O.R.S.

The physical and chemical properties of humic acids from a number of composted organic materials and from soils were studied. They could be divided into 4 groups: (1) Spruce and Beech humic acids, distinguished by their weak colouring; (2) those from substances rich in protein, e.g. green plant material, characterized by a content of complexes rich in N, and acid-decomposable; (3) humic acids from e.g. composted straw and bog peat, characterized by lignin and lignin-like complexes; and (4) those of the black-earth type, in particular, grey humic acids, clearly distinguished from the brown-earth humic acids (1)–(3) above.

35. SPRINGER, U., and LEHNER, A. Stoffabbau und Humusaufbau bei der aeroben und anaeroben Zersetzung landwirtschaftlich und forstwirtschaftlich wichtiger organischer Stoffe. **[Decomposition and humus formation from important agricultural and forest organic materials in aerobic and anaerobic conditions.]** *Z. PflErnähr. Düng.* 58 (3), 1952 (193–231); 59 (1), 1952 (1–27). 16 refs. [G.g.] O.R.S.

Results of 4- or 8-year laboratory experiments with green material, straw, Spruce and Beech litter, peat dust and well decomposed bog peat.

36. MATTSON, S., and KOUTLER-ANDERSSON, E. **The acid-base condition in vegetation, litter and humus. XI. Acid and base in decomposing litter.** *K. Lantbr. Högsk. Ann., Uppsala* 21, 1954 (389–400). 2 refs. [E.] O.B.D.

Presents data on the decomposition of litter in cylinder experiments over a period of 14 years, and discusses the acidity of humus in relation to leaching, base status and autoxidation. Materials used in the study were: Spruce, Pine and Larch needles, leaves of Beech, Birch, Ash, Alder (*Alnus incana*), Elm (*Ulmus glabra*), Oak, Maple (*Acer platanoides*), Hazel and Poplar (*Poplus alba*), lichen, wheat and oat straw, Spruce twigs and lucerne hay.

37. KNAPP, R., and LINSKENS, H. F. Über Aminosäuren aus der Blattstreu einiger Pflanzenarten von Wäldern auf verschiedenen Böden. **[Amino acids from litter of forest species on various soils.]** *Naturwissenschaften* 41 (20), 1954 (480–1). 10 refs. [G.] [Universität Köln.] O.R.S.

Leaves and twigs from 8 tree, shrub and herb species were collected in Dec. 1952 from 2 sites, one on limestone, the other on loess-loam, and were kept moist in the laboratory at 17° C. until Dec. 1954, by which time they had decomposed to varying degrees; they were then analysed. Considerable differences were found between species in amino-acid content. Differences in contents between sites were very slight for both *Fagus sylvatica* and *Ilex aquifolium*. There was no relationship between the amino-acid content and that of substances colouring the solution dark brown. The pH values of the solutions were high. No sugars were found. Results are tabulated.

114.4. Soil Classification. Soil Types

See also Nos. 249, 255–6.

38. KUBIËNA, W. L. **Atlas of soil profiles.** T. Murby & Co., London. 1954. pp. 1 + 23 coloured plates. [E.]

Contains looseleaf plates of soil profiles from the author's *The soils of Europe* [see *For. Abstr.* 15 (No. 1044).]

39. DUCHAUFOUR, P. Les sols des forêts résineuses des Basses-Vosges. **[The coniferous forest soils of the lower Vosges.]** *Rev. for. franç.* 7 (9/10), 1955 (675–88 + 4 photos). 7 refs. [F.]

A Silver Fir/Beech forest in a brown mull soil appears to be the nearest to the natural climax type in this region, but it maintains itself only when human interference is at a minimum. In most sites the Beech has been eliminated and the evolution of the stand is then towards Fir with abundant *Deschampsia flexuosa* and *Vaccinium myrtillus* on brown podzolic soils or podzols. This development is particularly rapid on S. or S.W. aspects, where the Fir stage has often been passed and the sparse stand consists of poor Oak coppice with *Pinus sylvestris* interplanted. The final stage is then a Pine stand from which all broadleaved species have disappeared. The four fundamental ecological factors conditioning the evolution of these soils are held to be (1) the parent rock, (2) the presence or absence of broadleaved species, (3) topography, and (4) aspect.

40. OLIVEIRA, A. L. FRANCO DE. Estudos de pedologia florestal. Contribuição para o estudo dos solos no Perímetro de S. Matias (Viseu). **[Studies of forest soils. Soils of the area surrounding S. Matias (Viseu).]** *Publ. Serv. flor. aqüic. Portugal* 19 (1/2), 1952 (5–31 + 1 map). 10 refs. [Port.f.]

Studies of soil profiles and chemical and physical analyses of soil samples suggest a classification into the following categories: (1) Lithosols and lithosolic soils—ca. 85·3% of the area studied. These are the most eroded soils. Afforestation with *Pinus pinaster* is recommended, with an underwood of *Crataegus monogyna, Arbutus unedo* and *Viburnum tinus*. (2) Brown podzolic forest soils—ca. 3·1% of the area. These are the most developed soils, suitable for afforestation with broadleaved species such as *Quercus robur* and *Q. pyrenaica*. (3) Brown forest soils (intensively grazed)—These are deep soils having the characteristics of prairie soils. In addition to *Pinus pinaster* they can support more exacting species such as *Castanea sativa, Q. pyrenaica* and *Q. robur*. (4) Rocky outcrops—ca. 10% of the area. The nature of the parent rock, along with the climatic conditions, favour podzolization, which extensive afforestation with *P. pinaster* may accelerate.

41. CALTON, W. E., TIDBURY, G. E., and WALKER, G. F. **A study of the more important soils of Zanzibar Protectorate.** *E. Afr. agric. J.* 21 (1), 1955 (53–60). 4 refs.

A classification, with descriptive notes, maps, and sections across the islands, of the soils of Zanzibar and Pemba, with notes on the growth responses of annual and perennial crops, including *Eugenia caryophyllata*.

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See also Nos. 51–2, 403, 704–10, 716, 738.

42. WILDE, S. A., and VOIGT, G. K. **Analysis of soils and plants for foresters and horticulturists. (Diagnosis of soil productivity by field and laboratory methods.)** J. W. Edwards Inc., Ann Arbor, Mich. 1955. pp. 118. Many refs. Price $3·75 (£1. 10*s*.).

A description of modern techniques, covering: analysis of physical properties of soils; analysis of chemical characteristics of soils; determination of chemical and physico-chemical properties of groundwater; microbiological analysis of soils, humus, and composts; floristic and mensurational analysis of native vegetative cover; chemical analysis of plant tissues; determination of morphological and physiological characteristics of nursery stock. [Cf. *For. Abstr.* 17 (No. 111).]

43. WALKER, L. C. **Foliar analysis as a method of indicating potassium-deficient soils for reforestation.** *Proc. Soil Sci. Soc. Amer.* 19 (2), 1955 (233–6). 12 refs. O.R.E.

Exchangeable K in K-deficient Adirondack sand plains was found to be related to K in the foliage of *Pinus strobus, Fagus grandifolia, Populus tremuloides, Fragaria virginiana* and *Andropogon gerardi* among the species tested. Foliar K decreased from early July to mid-August for *P. strobus, Acer rubrum* and

Prunus virginiana. Plants fertilized with KCl were analysed for comparison. Exchangeable K in concentrations < 20 p.p.m. usually results in K-deficient *P. strobus*. A tentative table (based on 1 season's samplings) of critical K values, indicating deficient sites, is given.

44. VIRO, P. J. **Use of ethylene diaminetetra-acetic acid in soil analysis: I. Experimental. II. Determination of soil fertility**. *Soil Sci.* 79 (6), 1955 (459–65); 80 (1), 1955 (69–74). 16 refs.

These papers compare the efficiency of the EDTA-NH_4 salt at different levels of pH as an extractant of exchangeable ions in the soil, with NH_4 acetate and other extractants. With other advantages stated, EDTA is recommended for acid soils but it can attack water-insoluble carbonates, not available in the exchange complex, in calcareous soils. The second paper tabulates the p.p.m. of Cu, Zn and Mo and mg./100 g. of CaO and P_2O_5 determined by EDTA in 57 iron podzols, natural to Scots Pine in Finland, and gives correlations of the status of these against site index (mean height of the largest 40 trees/acre at 60 years). Amounts of these substances in lb./acre in the top foot of soil (which contains 95% of the roots), are also given and the relation to fertility (site index) is discussed. It is concluded that EDTA is not so suitable for the determination of Mo or P.

45. WILLCOX, O. W. **Agrobiologic percentage method of evaluating fertilizer tests. I. Potash and tobacco. II. Phosphate and oats: mixed fertilizer and potatoes**. *Soil Sci.* 79 (6), 1955 (467–73), 8 refs.; 80 (1), 1955 (75–83), 7 refs.

(I) Outlines a statistical method, based on the Mitscherlich-Baule formula [cf. *For. Abstr.* 16 (No. 2609)], whereby differences smaller than those proved significant by conventional variance analysis can be proved of real significance and commercially important to growers.

(II) Using published examples, the normal and scattered yield curves, and those with far-end and near-end depression, in agreement with and varying from the Mitscherlich-Baule equation [cf. *For. Abstr.* 16 (No. 2609)], are described. The second type probably indicates marked variability in the nutrient status of plots; the third, excessive and depressing increments of fertilizer; the fourth, possibly the result of making good, by the application of fertilizer, a deficiency in a minor element, or the stimulation of inactive residual fertilizer. The advantage of the agrobiological % method for evaluating fertilizer trials (which depend on a regular law of diminishing returns) and the inapplicability of the Gaussian general theory of probability and its modern extensions are discussed.

114.6. Soil Biology

See also Nos. 33, 42, 98, 225, 318, 597–9.

46. BRAUNS, A. Angewandte Bodenbiologie. [**Applied soil biology.**] *Z. Weltforstwirt.* 18 (1), 1955 (11–6). 49 refs. [G.g.e.f.]

A general survey of the discipline of soil biology, its place in the scientific and ecological context, and its main branches—systematics, soil ecology, and, finally, applied soil biology chiefly concerned with soil fertility. About half the references apply to forest problems.

47. DUDDINGTON, C. L. **Fungi that attack microscopic animals**. *Bot. Rev.* 21 (7), 1955 (377–439). 131 refs.

A review of literature, under the main heads: historical outline; scope of present work; systematic review of the predacious fungi; physiology; ecology; other biological considerations; economic aspects; technique of study. These fungi have as yet been little studied; they attack chiefly amoebae and nematodes and are found in rotting wood, soil, dung and decaying plant material of many kinds.

48. DUCHAUFOUR, P., and POCHON, J. Note sur la biologie des humus forestiers. [**The biology of forest humus soils.**] *Annales de l'Institut Pasteur, Paris* 88 (2), 1955 (261–5). 4 refs. [F.] O.R.S.

A study of 3 types of humus soil showed abundant microflora activity in both lime-rich humus and mull, with rapid decomposition and, in the former soil type, synthesis of humic complexes. Mor soil showed a very much smaller microflora, and slow decomposition.

49. BURRICHTER, E. Regeneration von Heide-Podsolböden und die Entwicklung des Bodenkeimgehaltes in Abhängigkeit von der Bewaldung. [**Regeneration of heath podzol soils and the development of microbial activity in relation to forest cover.**] *Z. PflErnähr. Düng.* 67 (2), 1954 (150–63). 14 refs. [G.g.] O.R.S.

In studies of a humus podzol under dry heath and a humic gley podzol under damp heath, through stages of natural development to Birch and finally to Oak/Birch forest (60 and 200 years old on the dry and damp heaths respectively), it was found that both the humus content and the bacterial content in the different horizons increased in the successive stages of development. A 16-year-old Pine plantation on the dry heath differed very little in total bacterial content from the original heath.

50. CHASE, F. E., and BAKER, G. **A comparison of microbial activity in an Ontario forest soil under Pine, Hemlock and Maple cover**. *Canad. J. Microbiol.* 1 (1), 1954 (45–54). 21 refs. O.R.S.

Counts of bacteria, actinomycetes and fungi by the plate method on soil samples from the University of Toronto Forest, showed that the organic layer generally contained the largest population and that, under conifers, the fungi in it exceeded the other two groups combined, while under Maple the bacteria predominated. Tests of the nitrifying capacity of the soils, using the perfusion method, showed that nitrification did not occur to any extent except when lime was added, and then only very slowly unless a few crumbs of garden soil, presumably providing a source of active nitrifying bacteria, were also added.

51. KRASILJNIKOV, N. A., KORENJAKO, A. I., and MIRČENKO, T. G. O toksikoze podzolistyh počv. [**The 'toxicosis' of podzolic soils.**] *Izv. Akad. Nauk SSSR (Ser. biol.)* 1955 (3), (33–48). 26 refs. [Russ.] [Institut Mikrobiologii Akademii Nauk SSSR.] A.P.B.

Summarizes the results of studies all the year round in 3 successive years (1952–54), mainly near Chashnikovo, Moscow province, of soils: (1) under various types of forest cover, (2) from grassed-over clearings, (3) from clearings recently brought into cultivation, (4) from clearings long cultivated, and (5) under forest regeneration. Tests were made of the toxicity of soil, soil extracts and pure cultures of members of the soil microflora, against *Azotobacter* and seed and seedlings of crop plants—chiefly wheat and beetroot. *Azotobacter*, absent from uncultivated and forest soils, perished very rapidly when introduced into any but long and well cultivated soil, and especially rapidly in (1) and (5), where the life of the cells was only 2 hours. Seed and seedlings treated with aqueous soil extracts showed the same trend, soils (1) and (2) [(5) not mentioned] causing the most inhibition of germination and growth, and wheat being much less sensitive than beet, while peas were unaffected. Of the forest soils, those from under Norway Spruce or Aspen were the most toxic, and those from Birch or Oak woods much less so, *Azotobacter* and beet seed again being the most sensitive. Peak toxicity occurred from July to Oct., with a marked fall in winter and spring. That this difference was not due to more intense leaching in the latter period was shown by tests in which soil leached 4–5 times was still about as toxic to *Azotobacter* (as was also the first leachate) as before leaching. On the other hand, freezing at −15 to −20° C. for 2 months greatly reduced soil toxicity towards *Azotobacter*, though even autoclaving at 120° C. for 30 min. did not effect inactivation of the Chasnikovo soils. Application of $CaCO_3$, bringing the pH from 4·6 to 5·6–6, relieved the toxicity of forest podzols to *Azotobacter*; with application of MgO or NaOH, bringing pH to 6–7·4, the former enabled the bacterium to survive, in some quantity, to > 14 days but with no multiplication, while the latter gave survivals lasting ⩾ 5 days, hence the effect of liming cannot be simply that of adjusting the pH. In field conditions liming relieves toxicity to a lower degree, and manuring with stable manure has about the same effect. As micro-organisms were believed to be largely responsible for the toxic effects, microbiological analyses were made of the Chasnikovo soils. Of the organisms showing inhibition of *Azotobacter* and/or beet seed germination, (*a*) 50 pure cultures represented bacteria, (*b*) ca. 300, actinomycetes, and (*c*) 50, fungi. (*a*) The most toxic to *Azotobacter* were cultures of spore-bearing bacteria of the *Bacterium mesentericum* and *B. subtilis* groups, and, more rarely, *B. cereus* and some undetermined species. Toxic non-spore-bearing types included *Pseudomonas pyocyanea*, *P. fluorescens* and some others. Of these groups some inhibited *Azotobacter*, some beet germination, and some, both. The number of such bacteria varied from 5 to 450 thousand per g., depending upon locality and the condition of the soil, forest soils containing the most. The distribution of (*b*) was more or less uniform in the various soils, but (*c*)—referred to the genera *Fusarium*, *Cladosporium*, *Verticillium* and others—were most abundant in forest soils (1·4–17 thousand per g.). Of the micro-organisms, many more inhibited *Azotobacter* than those acting upon the higher plants. Some cultures of *Actinomyces griseus* stimulated germination of wheat while depressing that of beet.

52. BUBLITZ, W. Über keimhemmende und antibakterielle Substanzen im Bodenwasser der Fichtenstreu. **[Germination-inhibiting and anti-bacterial substances in soil water from Norway Spruce litter.]** *Naturwissenschaften* 41 (21), 1954 (502–3). 9 refs. [G.] [Botanische Abteilung Madaus-Köln.] O.R.S.

Paper chromatographic tests were carried out. Further experiments will be necessary for determination of the effective principle.

53. KARPPINEN, E. Punkit—metsämaan pikku muokkaajat. **[The role of mites in forest soils.]** *Metsät. Aikak.* 1955 (6/7), (203–5). 4 refs. [Fi.e.] (*Metsätietoa* 1955 (1).)

Between 67,000 and 160,000 mites/sq. m. were found in forest soil in a layer 5 cm. below the surface, the number varying with the site type. *From author's summary.*

54. VOLZ, P. Über die Rolle der Tierwelt in Waldböden, besonders beim Abbau der Fallstreu. **[The role of soil fauna in forest soils especially as regards the decomposition of litter.]** *Z. PflErnähr. Düng.* 64 (3), 1954 (230–7). 17 refs. [G.] O.R.S.

Gives data on the results of measurements on the macrofauna populations and of observations on litter decomposition on 3 woodland sites supporting different deciduous tree species.

55. WITTICH, W. Untersuchungen über den Verlauf der Streuzersetzung auf einem Boden mit starker Regenwurmtätigkeit. **[Investigations on litter decomposition on a site with great earthworm activity.]** *SchrReihe forstl. Fak. Univ. Göttingen* 9, 1953 (1–33). 11 refs. [G.g.]

A report on investigations at the Botanical Garden, Hann. Münden, supplementing an earlier series at Eberswalde [see *For. Abstr.* 7 (Nos. 1571–2)], re-examining the litter of 8, and adding 26 other woody species. The number of earthworms > 2 cm. long was nearly 150/sq. m. They generally prefer a diet rich in proteins, though other factors affected their choice, e.g. the smell and toxic substances in the leaf of *Myrica gale* (rich in proteins) repelled, whereas *Salix caprea* leaves, not very rich in N, attracted them. Out of a mixture of Alder, Elm, Oak and Beech they preferred the two first named to Oak and attacked the Beech last. All leaves were analysed for C, N (α-amino-N content being taken as protein content indicator) and mineral content, but no other significant correlation was found, though a preference for high Ca content seems probable. The order of decomposition is given, Elder and *Prunus padus* being the quickest and *Aesculus hippocastanum* the slowest. Ranking of the newly tested species in the Eberswalde scale proved impossible owing to the decisive difference in soil fauna, notably earthworms, but it was again shown that faunal burrowing action was essential to the decomposition of conifer needles (*Pinus nigra* and *P. strobus*). In a parallel series of tests (1951) on a

biologically inactive and acid raw-humus soil under Spruce at Gahrenberg, with litter of 38 woody species, decomposition was not yet much advanced, but most so in leaves of Elder, *Ulmus campestris*, and *U. glabra*; Alder and *Viburnum opulus*, all rich in proteins.

56. Sokolov, D. F. O roli kivsjakov v razloženii organičeskogo veščestva v počvah pod lesnymi nasaždenijami v stepi. [**The role of millipedes (*Julus sabulosus*) in the breakdown of organic matter in soils under steppe shelterbelts.**] *Dokl. Akad. Nauk SSSR* 100 (3), 1955 (563–6). 2 refs. [Russ.] [Institut Lesa Akademii Nauk SSSR.] A.P.B.

Gives some results from field and laboratory studies at the Derkul'sk Shelterbelt Research Station. In block plantations [age not stated] of Oak/Ash/*Caragana arborescens* and Oak/Ash, and a 52-year shelterbelt, 60 m. wide, of Oak/Ash/*Ulmus* spp., the millipede populations in thousands/ha. were respectively 411, 812 and 489 in early July, and the estimated production of excreta in kg. dry weight/ha./day were 1·65, 3·34 and 1·88, or from 250 to 500 kg./ha./growing season. Analyses are tabulated of the millipedes (*a*) and their excreta (*b*), including % ash, C and N in (i) the actual material, and (ii) water and acid extracts therefrom. The respective contents for (i) were—(*a*) 26, 31, 7·5, and (*b*) 39, 34, 2·7% (based on dry weight). Laboratory studies showed the highest millipede survival in soil and Oak leaves [litter?] and the lowest in soil alone. Over a 300-day period a vessel with soil + Oak leaves + millipedes showed a 57·9% loss of C and a 27·2% gain of N, based on the original amounts present in the leaves, whereas the same without millipedes, or Oak leaves alone, showed decreases of 50·5 and 57·2% for C and 13·0 and 18·6% for N. In laboratory tests in Sept.–Oct. the amounts of CO_2 evolved decreased in the order: soil + Oak leaves + millipedes; soil + Oak and Caragana leaves; Oak and Caragana leaves; Oak leaves + millipedes; Oak leaves; soil + millipedes; soil alone.

116. Hydrology. Water Conservation, Soil Conservation and Erosion

See also Nos. 11, 17–8, 28, 383, 388, 391, 430.

57. Arghiriade, C., and Abagiu, P. Contribuţii privind influenţa pădurii asupra topirii zăpezii. [**The influence of forest cover on snow melt.**] *Rev. Pădurilor* 70 (3), 1955 (109–18). 4 refs.

Report on research carried out by the Forest Research Institute, Bucarest, into the effect of forest cover on depth of snow, density of snow, date and duration of snow melt, and snow storage.

58. Beard, J. S. **Hydrological studies in the Natal Wattle belt.** *J. S. Afr. For. Ass.* No. 25, 1955 (40–51). 4 refs.

The design is detailed of experiments just initiated to investigate the effect of Wattle planting on water supplies in paired plots and in catchments subsequently to be afforested. Measurements include rainfall above canopy (62 ft.), and under canopy, by 5 gauges moved in series to 25 random selected stations; interception by grass on the grass plot and of trees by diameter classes; run-off, soil moisture to 6 ft. and the gauging of 4 streams. Local records reveal a secular cycle in annual rainfall of ca. 12 years from peak to low, with a steady decrease from 1942, a probable explanation of the observed drying up of perennial streams.

59. Rowe, P. B. **Effects of the forest floor on disposition of rainfall in Pine stands.** *J. For.* 53 (5), 1955 (342–8). 6 refs.

Presents the results of litter-pan, lysimeter and moisture-sampling experiments designed to measure evaporation from the forest floor (litter, duff, humus layers) of *Pinus ponderosa* and *P. radiata* in California, and the influences of the floors on surface run-off, percolation and evaporation from the soil. Under the conditions studied, floors ½ in. deep controlled surface run-off and total evaporation nearly as well as floors of greater depth. [Cf. *For. Abstr.* 13 (No. 2743).]

60. **Water use compared for grass, brush and Pines.** *Rep. Calif. For. Range Exp. Sta. 1953*, [1954] (45–9).

On deep soils, annual grass did not dry the whole soil column, whereas Oak-brush and Coulter Pine did. Grass and Pine used water more rapidly during the rainy season than the Oak-brush. In soils < 5 ft. deep all 3 types of plant would use all the available water.

61. Thames, J. L., Stoeckeler, J. H., and Tobiaski, R. **Soil moisture regime in some forest and non-forest sites in northern Wisconsin.** *Proc. Soil Sci. Soc. Amer.* 19 (3), 1955 (381–4). 4 refs. O.R.E.

Two sets of comparisons are described. (I) (*a*) An open field of timothy grass with (*b*) a site stocked with *Populus tremuloides* plus some northern hardwoods and conifers on a moist, silt-loam having poor drainage and a fairly compact B horizon. Measurements from May to Nov. 1953 showed less available soil moisture in the surface 1 to 2 feet of (*b*). This was drawn down to about 11·0% of total moisture, or 0·7% of available water compared with 18·0 and 9·8% respectively for (*a*). Bulk density under (*b*) was 25% less for the top foot and 32% less for the top 2 feet, with corresponding differences in field moisture capacity. Interception was considerable; run-off, owing to the level site and high infiltration capacity, was considered negligible. (II) Two sandy forested sites distinguished chiefly by the relative depth of their permanent water-tables—1·45–2·87 ft. compared with 4·34 to 5·43 ft. for May–June. There was ca. 0·4 in. more water (ca. 4% on a moisture % basis) in the surface foot of the former. Stocking in both was chiefly *Pinus banksiana*, with some *Populus tremuloides*. The site-index difference was slight for Pine but a full class (67 ft. versus 57 at age 50) for Aspen.

62. Trousdell, K. B., and Hoover, M. D. **A change in ground-water level after clearcutting of Loblolly Pine in the Coastal Plain.** *J. For.* 53 (7), 1955 (493–8). 2 refs.

The year-round groundwater levels in a hard impermeable soil in Pine/hardwoods are plotted against daily rainfall, for observation wells dug in selection and uncut stands. In the latter a 200-ft. strip was clear-felled in August, with an immediate rise in the water-table from feet below to feet above that of the selection stand, a relation reassumed in the second growing season. Another graph shows the levels at the beginning and end of a fortnight in Sept. of 10 intermediate wells set ½ chain apart in a straight line through cut and uncut strips into the selection stand. This shows high levels under cleared strips, dips under uncut strips and a steep and deep decline into the selection forest. These observations bear out the need for less drastic cutting systems in such areas, where the rise of the water-table after clearing raises the cost of wet-season logging and damages residual seed trees, and where over-wet conditions may also destroy germinating seed in some years.

63. PILLA, C. Il metodo detto a regime condizionato nelle ricerche sperimentali di interesse forestale. **[The 'conditioned regime' method in experimental hydrological research of forestry interest.]** *Monti e Boschi* 6 (7), 1955 (291–300). 17 refs. [It.]

Briefly reviews the classical large-scale investigations, and then describes the methods developed at Florence for rapid determination of rates of run-off and stream-flow for different sites and land under different uses, by an overhead sprinkler system simulating various degrees of rainfall. Some account is also given of the rain gauge and apparatus for measuring run-off and stream-flow. The whole outfit is readily portable.

64. GARCIA NAJERA, J. M. El bosque, el agua y la conservación del suelo. Principios racionales de la influencia del monte en la escorrentía superficial. **[Forests, water and soil conservation. Rational principles governing the influence of the forests upon run-off.]** *Montes, Madrid* 11 (63), 1955 (203–5). [Span.]

Presents formulae, borne out by laboratory experiments, for estimating the velocity of run-off on (1) denuded slopes, and (2) slopes supporting vegetation.

65. JAMES, G. A. **The relationship between precipitation and stream flow on a typical southeast Alaska stream.** *Tech. Note Alaska For. Res. Cent.* No. 24, 1955. pp. 3. 1 ref.

A study on a representative forested watershed showed that it was very sensitive to rainfall intensity, small amounts of rainfall causing small peaks in stream discharge, and large amounts, flood flows. Time between peak precipitation and peak run-off is short. There is low groundwater storage capacity and high surface run-off.

66. CAPPUCCINI, G. Rapport sur les recherches concernant les méthodes de conservation et d'utilisation du sol dans les hauts bassins de réception, en particulier sur les parties de ces bassins situées au-dessus de la zone de la végétation forestière. **[Research on soil conservation and land use in high catchment areas, particularly in those parts of them that lie above the timber line.]** [*Pap.*] *3rd Sess. FAO European For. Comm., Working Party on Torrent Control*, No. *FAO*/55/5/3182, 1955. pp. 48. 22 refs. [F.]

Includes summaries of reports from Western Germany, Austria, Spain, France, Greece and Switzerland.

67. TJAOE, I. K. Perlindungan tanah di pulau Bali.] **[Soil conservation on the island of Bali.]** *Rimba Indonesia* 4 (1/2), 1955 (5–9). [Jav.e.]

The soil, a young volcanic material, is very subject to water erosion. Measures taken to prevent this include: afforestation and protection against fire on the Forest Service area (21% of the island); regulations controlling clear felling on the coffee-growing area (3%); and regulations governing ravine areas (3%). A commission was set up in 1953 at Denpasar to make regulations for land outside the forest area. *From author's summary.*

68. NEWMAN, J. C. **Tumut catchment area: survey of vegetation and erosion. Part IV.** *J. Soil Conserv. Serv. N.S.W.* 11 (3), 1955 (146–62).

[Cf. *For. Abstr.* 16 (No. 3928).] Discusses vegetation/water relations, siltation, erosion, soil creep etc.

14. Systematic Zoology

145.7. Insecta. Entomology

See also Nos. 588 *et seq.*, 963 *et seq.*

69. SCHMIDT, G. Deutsche Namen von Schadinsekten. **[German names of insect pests.]** *Mitt. biol. Bundesanst. Land- u. Forstw.* No. 84, 1955. pp. 174. 73 refs. [G.]

In two parts: (1) names of families, orders etc.; (2) species names. Both are arranged in German/Latin and Latin/German sections, the latter giving for (2) the specific epithet first, followed by the genus, a separate generic index being appended. Covers some other arthropods, especially mites, in addition to insects, and includes some species that are not strictly pests, plus some useful species. A selection of extra-European species is also included.

70. GAY, F. J. **Common names of insects and allied forms occurring in Australia.** *Bull. Commonw. sci. industr. Res. Organ. Aust.* No. 275, 1955. pp. 32.

71. SKAIFE, S. H. **Dwellers in darkness: an introduction to the study of termites.** Longmans Green and Co., London. 1955. pp. 134 + 14 plates. 13 refs. Price £1. 5*s.*

72. CHAUDHRY, G. U. **Notes on a collection of termites from Pakistan.** *Pakistan J. For.* 5 (1), 1955 (40–3).

Describes 10 species: *Cryptotermes dudleyi, Heterotermes indicola, Odontotermes assamensis, O. feae, O. almorensis, O. parvidens, Microtermes* sp., *M. mycophagus, M. unicolor* and *Eremotermes paradoxalis.*

73. URQUHART, F. A. **The introduction of the termite into Ontario.** *Canad. Ent.* 85 (8), 1953 (292–3). O.R.S.

The first authentic specimens of *Reticulitermes flavipes* were found in Toronto in 1938. Brief notes on this and subsequent occurrences are presented.

74. HARRIS, W. V. **An American termite in imported timber.** *Wood* 20 (9), 1955 (366–7).

Living *Zootermopsis angusticollis*, the Western American damp-wood termite, have recently been found in wood believed to be Douglas Fir, imported into the U.K. from W. Canada. The castes are described, with biological and field notes. It is one of the least susceptible to cold of all termites, living in the Sierra up to 9000 ft., under conditions of snow and ice in winter.

75. BALACHOWSKY, A.-S. Étude comparative des cochenilles du cèdre au Liban et en Afrique du Nord. **[Comparative study of the Coccoidea of *Cedrus* in the Lebanon and in North Africa.]** *Rev. Path. vég.* 33 (2), 1954 (108–14). [F.] I.M.I.

Lists 3 species living on the Atlas Cedar and 4 on the Lebanon, one of the latter, a new species, being critically described with drawings. The species in the two areas are quite different. Those of N. Africa are apparently more specific to Cedar, those of the Near East occur also on Fir, Pine, Cypress or Juniper.

76. REMAUDIÈRE, G. Les Cinarini (Hom. Aphidoidea Lachnidae) du Cèdre en Afrique du Nord. **[The Cinarini on Cedars in N. Africa.]** *Rev. Path. vég.* 33 (2), 1954 (115–22). 3 refs. [F.] I.M.I.

Describes with drawings a new genotype *Cedrobium laportei* sp. nov. and distinguishes from it *Cinara cedri* (Mimeur 1935).

77. UNDERWOOD, G. R. **The external morphology of the five forms of *Pineus pinifoliae* (Fitch) (Homoptera: Phylloxeridae).** *Canad. Ent.* 87 (5), 1955 (201–9). 13 refs. O.R.S.

78. BENNETT, W. H. **The metamorphosis of the Pine leaf miner (*Exoteleia pinifoliella* (Chamb.)) (Lepid. Gelechiidae).** *Canad. Ent.* 86 (7), 1954 (310–1). O.R.S.

79. MATHUR, R. N. **Immature stages of Indian Lepidoptera No. 9—Pyralidae, sub-family Pyraustinae.** *Indian For. Rec.* (*n.s.*) 8 (11), 1954 (241–65 + 4 plates). 2 refs.

80. MCGUFFIN, W. C. **Descriptions of larvae of forest insects: *Syngrapha*, *Autographa* (Lepidoptera: Phalaenidae).** *Canad. Ent.* 86 (1), 1954 (36–9). 6 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 101.) O.R.S.

Syngrapha selecta, *S. alias*, *S. celsa*, *S. epigaea* and *Autographa ampla*.

81. SCHIMITSCHEK, E. Schlüssel zur Bestimmung der wichtigsten forstlich schädlichen Käfer. **[Key for the identification of the most important beetles injurious to the forests.]** Springer Verlag, Wien. 2nd ed. (rev.) 1955. pp. 109 + 3 plates. [G.]

82. GARDINER, L. M. **Differential growth as evidence of the relationship of *Monochamus notatus* (Drury) and *M. scutellatus* (Say) (Coleoptera: Cerambycidae).** *Canad. Ent.* 86 (10), 1954 (465–70). 6 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 159.) O.R.S.

83. GARDINER, L. M. **Larval description of *Acanthocinus pusillus* Kby. (Coleoptera: Cerambycidae.)** *Canad. Ent.* 87 (5), 1955 (219–20). 2 refs. O.R.S.

84. GARDINER, L. M. **Larval description of *Acmaeops proteus* (Kby.) (Coleopt., Ceramb.).** *Canad. Ent.* 86 (4), 1954 (190–2). (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 117.) O.R.S.

85. WATSON, W. Y. **A description of the full grown larva of *Hylobius radicis* Buch. (Coleoptera: Curculionidae.)** *Canad. Ent.* 87 (1), 1955 (37–41). 2 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 186.) O.R.S.

86. MATHUR, R. N. **Immature stages of Indian Coleoptera (25) Curculionidae.** *Indian For. Rec.* (*n.s.*) 8 (9), 1954 (227–31 + 2 plates). 14 refs.

87. ANDERSON, J. M., and FISHER, K. C. **The response of the White Pine weevil to ground up tissue of susceptible and non-susceptible trees.** *Abstr.* in *Revue Canadienne de Biologie*, *Montréal* 13 (5), 1954 (447). [E.] L.S.

In an olfactometer which measured quantitatively the response of *Pissodes strobi* adults, the odour from 3 native Spruce species and White Pine [*Pinus strobus*] was repellent, whereas that from 3 exotic Spruce species was neutral. The White Pine results suggest that some other factor(s) is involved. For the other species there is correlation between laboratory findings and susceptibility in the field.

88. WOOD, S. L. **Bark beetles of the genus *Carphoborus* Eichoff (Coleoptera: Scolytidae) in North America.** *Canad. Ent.* 86 (11), 1954 (502–26). 7 refs. (*Contr. Div. Ent. Dep. Agric. Can.* No. 3251.) O.R.S.

Notes on intraspecific and geographical variation and phylogeny, with descriptions of the species and a key.

89. CHAPMAN, J. A. **Sex determination by stridulation sounds in the Douglas-Fir beetle, *Dendroctonus pseudotsugae*.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 11 (3), 1955 (2).

90. MAXWELL, D. E. **The comparative internal larval anatomy of sawflies (Hymenoptera: Symphyta).** *Canad. Ent.* 87 (Suppl. 1) 1955. pp. 132. 69 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 180.) O.R.S.

91. GHENT, A. W. **Oviposition behaviour of the Jack Pine sawfly, *Neodiprion americanus banksianae* Roh., as indicated by an analysis of egg clusters.** *Canad. Ent.* 87 (6), 1955 (229–38). 3 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 213.) O.R.S.

Egg clusters were located with significant regularity towards the tip of the shoot. No preference was shown for the right or left needles of the needle pair. Oviposition on the basal edges of the needles predominated; this predominance arises from a strong preference for the lower gravitational edge of the needle, a preference satisfied by the basal edges of needles on the majority of Jack Pine shoots, which are orientated at angles above the horizontal. Egg number per needle was found to bear a strong positive correlation with needle length, suggesting that what is effectively a characteristic egg number per needle for the species arises from the narrowly limited variation in the length of Jack Pine needles. *From authors' summary.*

92. GREEN, G. W. **Some laboratory investigations of the light reactions of the larvae of *Neodiprion americanus banksianae* Roh. and *N. lecontei* (Fitch) (Hymenoptera: Diprionidae).** *Canad. Ent.* 86 (5), 1954 (207–22). 2 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 130.) O.R.S.

Fed *N. banksianae* larvae of the first three instars are, on the whole, indifferent to discrete light at room temperatures; but when starved for 6 hours they become strongly photopositive. Fully fed 4th and 5th instars are positive to discrete light at room temperatures. The effect of short-term starvation on these later stages is evident in the more circuitous paths they follow in their positive response to a point source. First-instar larvae of *N. lecontei* are indifferent to discrete light when fully fed and, once again, starvation for 6 hours results in a strongly photopositive response. All other instars are positive to discrete light at room temperatures when fully fed, but some differences appear after starvation. Short-term starvation does not change the reaction of second and third instars but it does produce both a greater degree of indifference and some light compassing reactions in the last 3 instars. Larvae of *N. lecontei* infected with a polyhedral virus disease grow increasingly less positive to point-source light as the disease becomes established. Prolonged starvation of late-stage larvae of *N. lecontei*, up to 24 hours, results in increased indifference and some compassing in response to point-source light. Further starvation to 72 hours results in a reversion to strongly photopositive behaviour. Fed *N. banksianae* larvae of the first and second instars become photonegative to diffuse light between 37·2 and 37·3° C.; and third-, fourth- and fifth-instar larvae become photonegative between 35·5 and 36·4° C. When starved for 6 hours, *N. banksianae* larvae of the second and subsequent instars become photonegative to diffuse light at lower temperatures than when fully fed. This decrease in reversal temperatures is significantly different in instars III to V inclusive. Fully fed *N. lecontei* larvae of the first and second instars become photonegative to diffuse light between 43·7 and 44·1° C. All other instars become photonegative between 40·7 and 41·4° C. *From author's summary.*

93. GREEN, G. W. **Humidity reactions and water balance of larvae of *Neodiprion americanus banksianae* Roh. and *N. lecontei* (Fitch) (Hymenoptera: Diprionidae).** *Canad. Ent.* 86 (6), 1954 (261–74). 15 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 131.) O.R.S.

Larvae of *N. banksianae* and *N. lecontei* react to gradients of evaporation rate by aggregating at rates as high as 0·195 mm.^{3}/min.$^{-1}$, with indications that 6th-instar larvae, of *N. lecontei* at least, would show a preference near 0·240 mm.^{3}/min.$^{-1}$ if this rate had been presented to them in gradient form. Aggregations in an illuminated gradient are produced primarily by a klinokinetic mechanism. Larvae of both species demonstrate a strong dry reaction upon initial exposure to paired humidity-choices within an olfactometer at 28° C. It has been shown that distributions that appear at first to be static become quite dynamic as exposure is prolonged, and that, in time, a decided wet reaction occurs. Aggregations in chambers where paired humidity choices are presented are produced orthokinetically. The preference for regions of high evaporation rates, as indicated by laboratory experiments, is reflected in the distribution of both species on their hosts, and also in the selection of host trees on the basis of their exposure. Both species are normally found in the most exposed sites on the host and there is evidence that open-grown, stand-border trees are the most susceptible to attack, especially by larvae of *N. lecontei*. There is evidence to suggest that some tracheal control over the rate of water loss occurs in larvae of *N. banksianae* when they are starved in dry air. Although weight losses due to the evaporation of body water from these larvae are greatest when they are exposed to dry air, the rate of water loss becomes the same in dry and in moist air after 10 hours of exposure. Fifth-instar larvae of *N. lecontei* begin to lose body water at a much more rapid rate in dry air at temperatures near 40° C. This temperature corresponds closely to the mean light-reversal temperature of this instar. *Author's summary.*

94. GREEN, G. W. **The functions of the eyes and antennae in the orientation of adults of *Neodiprion lecontei* (Fitch).** *Canad. Ent.* 86 (8), 1954 (371–6). 2 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 128.) O.R.S.

Adults of *N. lecontei*, with both or with only one type of eye functioning, orientate to the polarization pattern of the overhead sky; the paths they follow may also be influenced by body temperature and stimulation of the antennae by wind. Outdoor tests with blinded adults indicate that they respond to the sun at high temperatures as a source of radiant heat, and thus the responses of some insects to directed radiation may reduce or even nullify their usual response to sudden shifts in the polarization pattern of the overhead sky.

95. WATSON, W. Y. **Two gynandromorphic sawflies.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 11 (3), 1955 (1).

Describes two abnormal specimens of *Neodiprion sertifer*.

96. RIEK, E. F. **Australian leaf-mining sawflies of the genus *Phylacteophaga* (Hymenoptera: Tenth-**

redinidae). *Aust. J. Zool.* 3 (1), 1955 (95–8 + 6 photos). 1 ref. [Division of Entomology, Commonwealth Scientific and Industrial Research Organization.] O.R.S.

A key to and descriptions of *P. eucalypti*, *P. eucalypti tasmanica* subsp. nov., and *P. froggatti* sp. nov.

97. Riek, E. F. **The Australian sawflies of the family Orussidae (Hymenoptera: Symphyta).** *Aust. J. Zool.* 3 (1), 1955 (99–105 + 5 photos). 8 refs. [Division of Entomology, C.S.I.R.O.] O.R.S.

Systematics of 8 Australian species whose larvae are believed to be unique in being internal parasites of wood-boring larvae (Buprestidae).

98. Brauns, A. Puppen terricoler Dipterenlarven: eine Einführung in die Kenntnis der Ruhestadien bodenlebender Zweiflüglerlarven der Waldbiozönose auf systematischer Grundlage. [**The pupae of terricolous larvae of the Diptera: an introduction to the resting stages of soil-inhabiting fly larvae of the forest biocoenosis, on a systematic basis.**] 'Musterschmidt', Wissenschaftlicher Verlag, Göttingen, Frankfurt and Berlin. 1954. pp. 156 + 67 line drawings and 8 photos, with accompanying text + 1 dgm. 5 pp. of refs. [G.] Price [£2. 2*s*. 0*d*.]

A companion to the author's work on the larvae [see *For. Abstr.* 16 (No. 1389)], containing keys to the puparia and pupae of the most frequent Diptera of this ecological class, notes on soil biological aspects (place of pupation, with special reference to decaying stumps), and a general section dealing with important taxonomic characters, the classification of pupae, and a key to the most frequent pupal forms in the Holometabola. There is an index to subjects and scientific names.

15. Animal Ecology. Game and Fish Management, Hunting, Shooting and Fishing

See also Nos. 429, 442, 580 *et seq.*

99. Leedy, D. L. **Some contributions of the cooperative Wildlife Research Units to forest wildlife management.** *J. For.* 53 (9), 1955 (630–5). 32 refs.

Reviews the establishment, administration and financial support of these units; training in wildlife studies; and the salient items in forest wildlife research since 1935 under the heads: game birds, deer, bear, sheep and goats, fur animals and predators. Important improvements to game regulations (often improving the harvest) are instanced. The 17 units with their academic headquarters are listed.

100. Turček, F. J. Výpočet priemerného (stredného) dňa a jeho dôležitost' v lesníckej fenológii. [**Evaluation of the average (mean) date and its significance in forest phenology.**] *Les, Bratislava* 2 (7), 1955 (295–8). [Slovak.]

Applies statistical criteria (standard deviation, mean error of the mean) to dates of phenological phenomena (e.g. swarming of a beetle species). The probability level is taken as S.D. × 3, corresponding to > 99%. The significance of difference of the mean date between 2 localities is ascertained by means of the *t*-test.

101. Pașcovschi, S. Incercări cu cuiburi artificiale pentru păsări insectivore. [**Studies in the use of nesting boxes to attract insectivorous birds.**] *Rev. Pădurilor* 70 (6), 1955 (296–7). [Rum.]

Tits, fly-catchers, and tree-creepers have all nested in the boxes provided in the Bazos forest park. The principal impediment to their nesting was the common dormouse (*Muscardinus avellanarius*), which occupied many boxes continuously.

102. Neal, E. G. **Badgers in woodlands.** *Leafl. For. Comm., Lond.* No. 34, 1955. pp. 10. Price 9*d*.

A short account of distribution, habits, food, and life cycle, with a discussion of the relation of badgers to forestry. It is concluded that badgers are more useful than harmful in the forest.

103. Morris, R. F. **Population studies on some small forest mammals in eastern Canada.** *J. Mammal.* 36 (1), 1955 (21–35). 22 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 146.) O.R.S.

The data used were obtained on 21 plots in New Brunswick and the Gaspé Peninsula, in 1941. Live traps and snap traps were used. The red-backed vole was the predominant species in all coniferous and mixed stands, and the deer mouse, cinereous shrew and short-tailed shrew were other common species. The combined population of all species at the peak of the seasonal cycle varied from 0·6 to 15·0/acre. Population density was directly related to the amount of protective cover on the forest floor, slash from partial cutting operations being particularly favourable. *From author's summary.*

104. Mould, R. C. L. **Designing game coverts.** *Quart. J. For.* 49 (4), 1955 (281–6).

Discusses the design of coverts and suggests measures by which the interests of forestry and shooting can be reconciled.

105. Stegeman, L. C. **The production of Aspen and its utilization by beaver on the Huntington Forest.** *J. Wildlife Mgmt.* 18 (3), 1954 (348–58). 11 refs. B.A.P.

Despite increasing utilization of Aspen for pulpwood, it is still considered a weed species in inaccessible areas, where its management for beaver food may prove to be the best use the land can be put to. On an area typical of the Central Adirondacks, estimates were made of the amount of beaver food produced by Aspen stands. The size of Aspen producing the greatest amount of beaver food per acre was the 1-in. diameter class, which averaged 6·6 years of age. The most advantageous rotation for Aspen for beaver-food production would be ca. 10 years. The commercial value of the study area for the production of Aspen as wood was nil. Its value for production of hardwoods was ca. $2·07 per acre per year under management, and its value under an extensive type of management for the production of beaver pelts, ca. $2·98 per year.

106. Westell, C. E., Jr. **Available browse following Aspen logging in Lower Michigan.** *J. Wildlife Mgmt.* 18 (2), 1954 (266–71). 2 refs. B.A.P.

Since logging of Aspen for pulpwood in Lower Michigan is increasing rapidly, a study was made

of the value of root suckers as browse for white-tailed deer and the effects of browsing on regeneration. In a 10-county area on the west side of the state 21%, and in a 12-county area on the east side 42% of Aspen suckers were browsed. Number of suckers in logged areas varied from 1000 to 35,000/acre, with an average of 9000. Evaluations of the amount of browse available to deer in typical sucker stands show that they afford relatively large quantities for a few years after felling. At a rough estimate, if in 3–5 years after felling 1–3 suckers/milliacre have grown beyond the reach of the deer, stocking is still adequate for proper regeneration. In general, it is estimated that ½ to ⅔ of the available browse can be safety taken by the deer.

107. JULANDER, O. **Deer and cattle range relations in Utah.** *For. Sci.* 1 (2), 1955 (130–9). 8 refs.

Grazing patterns and factors were studied on random plots on a 49-sq.-mile natural deer/cattle unit. A map shows 4 categories of combined and mutually excluding use of the unit by these animals and the boundary of the winter range. Tables give the forage species in lb./acre, % use, and the proportions used by deer and cattle in 4 range types each of summer and winter range (5 years' data). Forage preferences in Utah are discussed in detail. The maximum sustained grazing use in the areas studied is limited: for exclusive cattle grazing, by the proper use of the perennial grasses; for exclusive deer grazing, by proper use of palatable shrubs and forbs; for combined grazing, by the proper use of shrubs and forbs palatable to both animals.

108. BRAMBLE, W. C., and BYRNES, W. R. **Effect of certain common brush control techniques and materials on game food and cover on a power-line right-of-way. No. 2.** *Progr. Rep. Pa. agric. Exp. Sta.* No. 135, 1955. pp. 7. 8 refs.

The spray treatments [described in earlier report, cf. *For. Abstr.* 16 (No. 4210)] all eliminated the shrub layer. Data were collected 2 growing seasons after application. The sprayed areas of the right-of-way appeared still to be attractive to game species.

109. KREFTING, L. W., HANSEN, H. L., and STENLUND, M. H. **Use of herbicides in inducing regrowth of Mountain Maple for deer browse.** *Minn. For. Note* No. 42, 1955. pp. 2.

In order effectively to kill back overgrown stems of *Acer spicatum* and greatly to increase the amount of regrowth available for deer browse, it is recommended that 2,4-D ester be applied at breast height to the stems (12 lb. acid equivalent/100 gal. oil) during the early bud-swelling stage.

110. DEWITT, J. B., and DERBY, J. V., JR. **Changes in nutritive value of browse plants following forest fires.** *J. Wildlife Mgmt.* 19 (1), 1955 (65–70). 9 refs. B.A.P.

Presents data on crude protein, ash, ether extract crude fibre and N-free extract contents of *Acer rubrum*, *Quercus alba*, *Cornus florida* and *Smilax rotundifolia* on burned and unburned plots.

16. General Botany

160. Plant Chemistry

See also Nos. 24, 30–7, 42–3, 55, 128, 403, 607, 823 *et seq.*, 956, 1025 *et seq.*

111. PAECH, K., and TRACEY, M. V. [Editors]. **Modern methods of plant analysis.** Springer Verlag, Berlin. 1955. pp. xii + 761. [E. or G.] Price *DM.*110·40 (£9. 7*s.* 11*d.*).

112. SANDERMANN, W., and CASTEN, R. Zur Frage der Urananreicherung in Pflanzen. **[Uranium accumulation in plants.]** *Z. Weltforstwirt.* 17 (3), 1954 (95–6). 1 ref. [G.e.f.]

Ash from the leaves, bark and branches of *Salix aurita*, *Alnus glutinosa*, *Sorbus aucuparia*, and other plants was compared with soil samples from the growing site, the entrance to a uranium-bearing mine in Weissenstadt, Bavaria, using a Geiger counter. Tabulated results show about 30–40 times as much U in the leaves as in the soil. In Willow and Alder, the accumulation in bark and branches is less than in leaves, but in Mountain Ash it is slightly more.

113. REZNIK, H. Über das Anthocyan des Herbstlaubes. **[Anthocyanin in autumn leaves.]** *Naturwissenschaften* 42 (7), 1955 (180–1). 11 refs. [G.] [Universität Heidelberg.] O.R.S.

A brief discussion of results—to be published in more detail elsewhere—of investigations on leaves with autumn colouring from 40 woody species. [Cf. *For. Abstr.* 16 (No. 3772).]

114. LUBLINER-MIANOWSKA, K. O barwnikach ziarn pyłkowych. **[The pigments of pollen grains.]** *Acta Soc. Bot. Polon.* 24 (3), 1955 (609–18). 23 refs. [Pol.e.] O.B.D.

115. SPRINGER, G. F. Über das Vorkommen blutgruppenaktiver Substanzen in der Eibe. **[The occurrence of blood-group-active substances in *Taxus cuspidata*.]** *Naturwissenschaften* 42 (2), 1955 (37–9). 14 refs. [G.] O.R.S.

Substances with blood-group activity were found in different parts of *T. cuspidata*, the highest activity being found in aqueous extracts of seeds and twigs.

116. PLOUVIER, V. Sur la recherche du *d*-quercitol chez quelques Fagacées et autres plantes. **[*d*-Quercitol in some Fagaceae and other plants.]** *C.R. Acad. Sci., Paris* 240 (1), 1955 (113–5). 2 refs. [F.] O.R.S.

d-Quercitol was isolated from leaves of all the 33 *Quercus* spp. studied, and from branches of some of them, from leaves of *Achras sapota*, *Mimusops elengi* and *M. caffra*, and from twigs and leaves of two *Cocculus* spp. None was found in three *Fagus* spp., in three *Castanea* spp., in *Menispermum canadense*, or in a number of Palms.

117. LANGLOIS-PLATEL, S., and MENTZER, C. Sur les constituants flavoniques des feuilles de merisier (*Prunus avium*). **[The flavone leaf constituents of *P. avium*.]** *C.R. Acad. Sci., Paris* 240 (10), 1955 (1137–9). 4 refs. [F.f.] O.R.S.

The 2 flavones isolated and examined (one quercetin, the other unidentified) are different from those from the wood. [See *For. Abstr.* 14 (No. 3757).]

161. Physiology

See also Nos. 153–7, 211 *et seq.*, 502, 548, 572, 791, 794, 801, 809, 955–6.

118. LEANDRU, L. Atomii marcați în fiziologia vegetală sovietică. **[The use of radioactive tracers for the study of plant physiology in the U.S.S.R.]** *Rev. Pădurilor* 70 (6), 1955 (250–3). 8 refs. [Rum.]

A short review, with some literature references.

119. PARKER, J. **Effects of vital staining on *Pinus ponderosa*.** *Abstr.* in *Plant Physiol.* 30 (Suppl.), 1955 (x). O.R.E.

Unbuffered solutions of 0·5% 2,3,5-triphenyltetrazolium chloride (TTC) or blue tetrazolium (BT) showed the greatest reduction of coloured compounds in the meristematic tissue of leaves, stems and roots of *P. ponderosa*. Large amounts were also reduced in ray parenchyma of phloem and xylem and in sheath cells of resin ducts. Vertical parenchyma in phloem of 30-year-old stems was quite reductive in the younger areas with both BT and TTC. Reduction of TTC was quite marked in resin of resin ducts of both leaves and 2-year-old roots; thus, whether it is reduced or not in sieve cells would seem to be a poor indication of whether these cells are 'alive' when functional. While reduction of both BT and TTC was observed in sieve-tube elements of *Helianthus annuus*, only slight reduction was seen in sieve-tube elements of *P. ponderosa* and this seemed to be largely in younger tissues. In leaves of the Pine, reduction of TTC has been observed in young tracheids, young phloem, hypodermis, transfusion parenchyma, endodermis, Strasburger cells, and chlorenchyma. Best results are obtained by sectioning after infiltration of whole tissues with these salts. Removal of O_2 for BT, and avoidance of light with TTC is important. Janus Green B (1 : 1000)stained *Helianthus* xylem and sclerenchyma cell walls pinkish and gave very uncertain results with Pine. Neutral red (1 : 1000) tended to accumulate in thicker-walled xylem cells and in vertical phloem parenchyma of Pine.

120. LOW, P. F. **Effect of osmotic pressure on diffusion rate of water.** *Soil Sci.* 80 (2), 1955 (95–100). 5 refs.

Develops an equation relating hydraulic and osmotic pressure gradients to the rate of diffusion of water, showing that osmotic pressure acts as a negative hydraulic pressure in its influence on water diffusion. The equation was tested for clay suspensions and shown to be valid. It is claimed to be applicable to diffusion of water in any system that is heterogeneous in respect of dissolved solutes, especially if these are restricted in movement by physical forces or mechanical barriers (e.g. the diffusion of water along the surface of soil particles where net ionic movement is restricted by electrostatic forces, or the diffusion of water through the differentially permeable membranes of plant roots).

121. BLAGOVEŠČENSKIĬ, A. V., and BOGRAČEVA, T. N. K izučeniju vodnogo režima èvkaliptov. **[The water régime of Eucalypts.]** *Fiziol. Rast.* 2 (3), 1955 (221–7). 5 refs. [Russ.russ.] A.P.B.

Tabulates and discusses the results of physiological tests on young seedlings grown at the Sochi arboretum, on the Black Sea coast, of species differing markedly in their habitats in Australia (*E. gigantea*, *E. dalrympleana*; *E. cinerea*, *E. umbellata*; *E. viridis*, *E. dwyeri*). The tests, at various seasons, covered transpiration rate, total water content of leaves, osmotic pressure of leaf cell-sap, and suction force of leaf cells. Results indicated that differences in physiology, presumably linked with differences in the native habitats, persist in the new environment.

122. GREENIDGE, K. N. H. **Observations on the movement of moisture in large woody stems.** *Repr.* from *Canad. J. Bot.* 33, 1955 (202–21). 7 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 171.)

The movement of moisture in a number of Canadian hardwood and softwood species was traced by introducing at 1–4 points on the circumference of the lower boles an aqueous solution of acid fuchsin, using Banfield's cone frustum technique [cf. *For. Abstr.* 3 (p. 250)]. The effect of partial sawing through the bole before inoculation at various levels, was also studied. Complete incision of the lower boles of trees of all species led to the development of fairly uniform staining patterns in the outermost growth layers in both longitudinal and transverse sections. Partial incision led to patterns showing pronounced centripetal transfer, and the prior sawing of the bole also encouraged lateral transfer. Patterns characteristic of the different treatments and species are illustrated and the implications of the results discussed. [Cf. *For. Abstr.* 16 (No. 3777).]

123. GREENIDGE, K. N. H. **Studies in the physiology of forest trees. III. The effect of drastic interruption of conducting tissues on moisture movement.** *Repr.* from *Amer. J. Bot.* 42 (7), 1955 (582–7). 4 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 193.)

Discusses the influence of such interruption in large woody stems, and describes the author's experiments showing that moisture continues to move to the apices of transpiring trees despite repeated mechanical severance of stretched water columns. Deviations from normality in the water relationships of large woody plants, resulting from various experimental treatments, are described. Attention is drawn to the coherence of the water-conducting system in trees, and the results are presented of preliminary experiments designed to explore the continuity of this system. *From author's summary.*

124. STANLEY, R. G. **Krebs cycle activity in germinating seeds of Sugar Pine (*Pinus lambertiana*).** *Abstr.* in *Plant Physiol.* 30 (Suppl.), 1955 (ii). O.R.E.

The pattern of respiration in germinating Sugar Pine seeds is related to the oxidative metabolism of a particulate fraction extracted from the homogenates of seeds and germlings subjected to centrifugal fields of 20,000 times gravity. Evidence based on mano-

metric and isotopic studies indicates that the constituent enzymes of the tricarboxylic acid cycle are present in the particulate fraction isolated. The physical and chemical changes that take place in the germinating seed, and that result in the activation of these loci of oxidative enzymes, may serve as a basis for interrelating the seed's general respiratory pattern.

125. BERNARD-DAGAN, C. Variations journalières de la teneur en glucides des aiguilles de pin maritime. **[Variations during the day in the carbohydrate content of needles of *Pinus pinaster*.]** *C.R. Soc. Biol., Paris* 149 (3/4), 1955 (360–4). 1 ref. [F.f.] O.R.S.

Needles from 7-year-old Pines showed both in June and in November an increase in the contents of carbohydrates during the day and a drop at night. Contents were higher in June than in November and reached a maximum in the afternoon and around mid-day respectively. The variations in carbohydrate content are closely related to variations in light. Similar results (to be published in more detail later) were obtained for resinic acids.

126. HUBER, B., and POLSTER, H. Zur Frage der physiologischen Ursachen der unterschiedlichen Stofferzeugung von Pappelklonen. **[The physiological causes for the differential production of Poplar clones.]** *Biol. Zbl.* 74 (7/8), 1955 (370–420). 40 refs. [G.g.] E.M.B.

Investigations were made at Munich and Tharandt on the rate of assimilation and respiration, quantity of foliage, increment, and yield of timber for single trees and stands, of a large number of clones of Poplar species and hybrids. The experimental data are set out in tables and graphs. The material consisted of *Populus deltoides* var. *missouriensis*, × *P. eugenei*, × *P. gelrica*, × *P. marilandica*, × *P. regenerata*, × *P. robusta*, × *P. serotina*, × *P. berolinensis*, × *P. generosa*, 'Oxford' Poplars, *P. trichocarpa*, and *P. nigra*. The results indicated marked differences between clones, and demonstrated close connexion between assimilation rate and production. Net daily assimilation varied from 2·29 g. CO_2 for *P. nigra* to 23·26 g. CO_2 for a Wettstein hybrid, and these were also respectively the lowest and highest producers of wood. The physiological efficiency of Poplars compared with other genera is stressed. The use of infra-red absorption methods for measuring assimilation and respiration is described. [Cf. *For. Abstr.* 13 (No. 66).]

127. BLAGOVEŠČENSKIĬ, A. V., and IVANOVA, I. P. Azotistyĭ obmen pri stratifikacii semjan. **[Nitrogen metabolism during the stratification of seeds.]** *Dokl. Akad. Nauk SSSR* 100 (3), 1955 (511–3). [Russ.] A.P.B.

Analyses of samples at 10-day intervals from seed of *Amygdalus communis* stratified for 60 days, at the end of which germination had begun, showed that after the 20th day there appeared to be progressive breakdown of proteins into simpler compounds still preserving the properties of proteins. Proteolytic enzyme activity increased markedly between the 20th and 30th days.

128. KURSANOV, A. L. O fiziologičeskoĭ roli vozdušnyh korneĭ u fikusa (*Ficus* sp.). **[The physiological rôle of aerial roots in a species of *Ficus*.]** *Fiziol. Rast.* 2 (3), 1955 (271–6 + plate). 18 refs. [Russ.russ.] [Institut Fiziologii Rastenii im. K.A. Timirjazeva Akademii Nauk SSSR, Moscow.] A.P.B.

In connexion with the habit of certain West African *Ficus* spp. of forming aerial roots during the rainy season, the author collected aerial roots, leaves and young shoots from a single tree of *Ficus* sp. in Senegal. The samples, dried as quickly as possible and stored in thick paper packets, were analysed on his return to Moscow. Paper chromatographic analysis indicated that the roots were rich in organic acids, especially di- and tri-carboxylic acids. As such acids are usually closely associated with the formation of amino-acids in plant tissues, it is probable that the aerial roots are capable of intensive synthesis of amino-acids. Analysis of the individual organs confirmed this, showing that the aerial roots were many (25–30) times richer in free amino-acids than the young leaves and shoots. In addition, 10 amino-acids were identified in the roots, compared with 7 in leaves and shoots. It is suggested that the physiological rôle of the aerial roots is to effect supplementary synthesis of amino-acids in this period of active growth.

162. Pathology. Teratology

129. NEVES, C. M. BAETA. Nota sobre a fasciação do pinheiro bravo (*Pinus pinaster* Sol. ex Ait.) na Ilha da Madeira. **[Fasciation of *P. pinaster* in [the Municipal Forests of Funchal,] Madeira.]** *An. Inst. Agron., Lisboa* No. 19, 1952/53 (103–6 + 9 photos). 2 refs. [Port.] C.G.B.

163. Embryology

130. WILDE, M. H., and EAMES, A. J. **The ovule and 'seed' of *Araucaria bidwillii* with discussion of the taxonomy of the genus. III. Anatomy of multiovulate cone scales.** *Ann. Bot., Lond.* 19 (75), 1955 (343–9 + 2 plates). 6 refs. O.R.E.

Cf. *For. Abstr.* 14 (No. 122).

164. Morphology

See also Nos. 233, 611.

131. GUERINDON, A. Étude cytologique du point végétatif de *Pinus maritima*. **[Cytological study on the growing point of *P. pinaster*.]** *C.R. Acad. Sci., Paris* 240 (5), 1955 (558–60). 4 refs. [F.] O.R.S.

132. WHITE, D. J. B. **The architecture of the stem apex and the origin and development of the axillary buds in seedlings of *Acer pseudoplatanus* L.** *Ann. Bot., Lond.* 19 (75), 1955 (437–49 + 2 plates). 16 refs. O.R.E.

133. ANDERSON, Y. O. **Seasonal development in sun and shade leaves.** *Ecology* 36 (3), 1955 (430–9). 22 refs.

The development of sun and shade leaves of *Cornus florida* and *Viburnum prunifolium* growing under contrasting light intensities was studied for

differences in growth, thickness, and morphological structure. Temperature and light conditions in a wood and in an open field, where the plants were found to occur, were compared. Leaves of *Viburnum* emerged and unfolded earlier than those of *Cornus* in the spring. In both species, larger leaf area, which was produced by earlier and larger increases in growth rate (especially at the time of most rapid leaf expansion), was attained by shade leaves. Mature sun leaves were considerably thicker than mature shade leaves. Sun and shade leaves increased in thickness in about the same proportions during the period of early growth. The greatest divergence between leaf thickness in the two leaf types occurred later than the corresponding differences in leaf area. Cell elongation, especially that of the palisade tissue, was found to be responsible for increases in blade thickness. There was no difference in the number of cell layers between sun and shade leaves, though it was greater in the mature rather than in the embryonic leaf. Embryonic leaves of sun and shade plants were basically alike in cell structure. The palisade and lowest spongy mesophyll were distinctly different from other layers. Changes in vacuolation of the embryonic cells were most marked during the time of leaf emergence and unfolding. Chloroplasts were also recognizable at this time. The initiation and formation of cells characteristic of the mature leaf, and increase in bud length and leaf expansion were decidedly earlier in shade leaves. Paradermal views showed the cells of the upper epidermis in shade leaves to be considerably larger and more distorted in shape than those in sun leaves. The drastic reduction of light penetration during and after the canopy had closed in the woods was closely associated with the appearance of differences in blade thickness between sun and shade leaves. Temperature, which was on the average higher and less extreme in the woods, may be one of the determining factors in producing earlier development in shade rather than sun leaves. *From author's summary.*

134. FLORIN, R. **The female reproductive organs of conifers and taxads.** *Biol. Rev.* 29 (4), 1954 (367–89). 5 pp. of refs. [Hortus Botanicus Bergianus, Stockholm.] O.R.S.

Different concepts are discussed and a new interpretation is proposed. [Cf. *For. Abstr.* 14 (No. 1011).]

135. MÜHLETHALER, K. Die Struktur einiger Pollenmembranen. [**The structure of some pollen membranes.**] *Planta* 46 (1), 1955 (1–13). 15 refs. [G.g.] O.B.D.

Includes studies of *Pinus nigra*, *Alnus rotundifolia*, *Corylus avellana*, *Fagus sylvatica* and *Quercus robur*.

136. DAHL, A. O. **The pollen morphology of several genera excluded from Icacinaceae.** *J. Arnold Arbor.* 36 (2/3), 1955 (159–63 + 8 drawings). 7 refs.

Provides morphological descriptions of the excluded *Pseudobotrys*, *Lophopyxis*, *Pteleocarpa*, *Metteniusa*, *Peripterygium*, and *Trichadenia*, and indicates possible affinities on this basis. *From author's summary.*

165. Phylogeny, Evolution. Heredity, Genetics and Breeding; Variation

See also Nos. 126, 168, 171, 178, 234, 316, 320–3, 575, 607, 640.

137. JABLOKOV, A. S. Šlechtění dřevin se základy lesního semenářství: Část I. Genetika. [**The selection and breeding of trees, with the bases of forest seed husbandry: Pt. I. Genetics.**] *Lesn. Knihovna* (*malá Řada*) No. 45, 1954. pp. 197. Many refs. [Cz.] Price *Kčs.* 16·90.

A translation of a Russian textbook (part II of which has not yet appeared), expounding the theory of genetics with main reference to the views of the Lysenko school.

138. FAULL, A. F. **Some factors in pollen germination.** *J. Arnold Arbor.* 36 (2/3), 1955 (171–88). 9 refs.

Reviews in detail experiments to show the effects on pollen germination and pollen-tube growth of various concentrations of Ca, Ba and Sr salts, dextrose and 6 other sugars, and of drying the pollen before application.

139. PAUL, B. H. **Importance of wood quality in tree breeding.** *J. For.* 53 (9), 1955 (659–61). 10 refs.

When volume growth per tree is the sole aim of breeding, it may be offset by poorer wood quality. In genetical studies this quality should be tested early for further selection. The production of figured wood (Walnut, Birch, Maple and Poplar) of more than average value is promising. Existing knowledge of wood quality is discussed with examples of both inherent and silviculturally induced characters. [Cf. *For. Abstr.* 8 (No. 2470).]

140. ELLERTSEN, B. W. **Selection of Pine superseedlings—an exploratory study.** *For. Sci.* 1 (2), 1955 (111–4). 13 refs.

Outstandingly tall seedlings are marked before lifting, and their height, together with those of 25 neighbouring plants, recorded. A seedling of the mean height of the latter and the tall seedling are planted out for further comparison, if the height difference is of sufficient account. The rigour of selection is 1 in 200,000 for *P. taeda* and *P. echinata*; that of *P. strobus* is 1 in 425,000, tall seedlings being less common. The growth and survival of the selections and controls in 1951–54 are compared.

141. BINGHAM, R. T., and SQUILLACE, A. E. **Self-compatibility and effects of self-fertility in Western White Pine.** *For. Sci.* 1 (2), 1955 (121–9). 28 refs.

In the 28 trees of *Pinus monticola* studied, self-pollination and crossing resulted in almost identical yields of cones but the former gave ca. 50% less seed, 275% more hollow seed, 7–13% less germinability and 11, 21 and 21% less height growth in the 1st, 2nd, and 3rd years respectively. The number of seedlings produced was also ca. 50% less than from crossing, and varied from the same selfing in successive years. Self-compatibility and self-fertility leading to the production of dwarf seedlings should be considered in tree breeding, in nursery

practice, in the selection and arrangement of clones in seed orchards and in the interpretation of wind-pollinated progeny performance.

142. MÜLDER, D. Beitrag zur Individualauslese bei der Blasenrost-Resistenzzüchtung mit *Pinus strobus*. **[Individual selection in breeding for blister-rust resistance in *Pinus strobus*.]** *Z. Forstgenet.* 4 (3), 1955 (89–99). 14 refs. [G.g.e.f.]

A study was made of infected Pine stands in Waldmichelbach Forest District, Odenwald, in order to throw light on the following points important in selective breeding: (1) severity of attack at different stand ages, (2) degree of individual infection and its distribution among the population, (3) influence of the environment, and (4) course of infection during the life-time of one tree. It was established that the % of infected trees rises with age. Wide differences are found in intensity of infection. The distribution of individuals showing different degrees of infection is always the same. Frequency of attack is related to severity of attack. No external factor was found influencing the distribution of infection. The disposition of the individual to disease is deeply rooted in the life rhythm of the tree, being primarily a function of age. The importance of these findings for breeding is discussed. *From author's summary.*

143. HOLST, M., and HEIMBURGER, C. **The breeding of hard Pine types resistant to the European Pine shoot moth (*Rhyacionia buoliana* Schiff.).** *For. Chron.* 31 (2), 1955 (162–9). 23 refs.

Neugebauer's work on the effect of resin production on tree resistance [see *For. Abstr.* 15 (No. 3803)] is discussed, and data from European and American literature on ecological preferences, hardiness, growth form, growth rate, and resistance in native habitat and in N. America are given in tabular form for 8 species of the *Lariciones* group. The possibilities are discussed of using the resistant *P. thunbergii* and *P. nigra* var. *austriaca* to improve the resistance of *P. sylvestris* and *P. resinosa*, and of using *P. densiflora* as a link in breeding between otherwise incompatible species.

144. NIENSTAEDT, H., and KRIEBEL, H. B. **Controlled pollination of Eastern Hemlock.** *For. Sci.* 1 (2), 1955 (115–20).

Describes with photographs the development of the cones of *Tsuga canadensis*, and graphs the number of viable seed per cone for each of 9 types of pollination bag, separately for the north and south sides of the tree, maximum temperatures in the bags being shown for the latter. Based on seed produced, the order of excellence was: unbagged, white cloth (only slightly less), parchment, Kraft, sausage casing, white paper, polyethylene, Kraft and polyethylene, black paper. The characteristics of each type of bag in relation to light, heat, moisture and weathering are listed and their effects on seed production discussed. Unpollinated bagged controls showed all to be efficient pollen barriers. The white cloth bag was of fine cotton poplin, 160 threads/inch, with double seams double-stitched.

145. NIENSTAEDT, H., and GRAVES, A. H. **Blight-resistant Chestnuts: culture and care.** *Circ. Conn. agric. Exp. Sta.* No. 192, 1955. pp. 18. 8 refs.

Summarizes the progress made at the Connecticut Agricultural Experiment Station in breeding Chestnut hybrids resistant to *Endothia parasitica*, with notes on their propagation and culture.

146. LĂZĂRESCU, C., COCALCU, T., and PURCELEAN, Ş. Contribuţii la hibridarea sexuată a stejarului. **[The sexual hybridization of Oaks.]** *Bul.şti. Acad. Rep. rom.* (*Sect. Şti. biol.*) 6 (4), 1954 (1071–85). 11 refs. [Rum.russ.f.] O.R.S.

The following hybrids were obtained for the first time as a result of artificial pollination: *Quercus pedunculiflora* × *Q. marilandica*, *Q. borealis* × *Q. cerris* and its reciprocal, *Q. macrocarpa* × *Q. pedunculiflora*, *P. pedunculiflora* × *Q. stellata*, *Q. robur* × *Q. stellata* and *Q. borealis* × *Q. marilandica*. A natural hybrid *Q. robur* × *Q. pedunculiflora* is recorded.

147. HEJTMÁNEK, J. O možnostech selekce břízy. **[Possibilities of selection of Birch.]** *Lesn. Práce* 34 (2), 1955 (52–7). [Cz.]

Besides the 'hard' and 'soft glossy' varieties of *Betula alba*, there grow in Czechozlovakia Birches representing transition forms between the 'hard' and 'flame' varieties. As wood properties seem to be inherited, it is recommended that seed should be collected from trees whose bark indicates the presence of wavy grain.

148. BARBER, H. N. **Adaptive gene substitutions in Tasmanian Eucalypts. I. Genes controlling the development of glaucousness.** *Evolution* 9 (1), 1955 (1–14). 30 refs. [University of Tasmania.] O.R.S.

The appearance of glaucousness on stems and leaves of *Eucalyptus* is shown to result either from the deposition of wax on the epidermis (the type studied here), or from structural features of the superficial tissues. The melting point of the wax appears to be related to other taxonomic characteristics, falling in the range 57–61° C. for the *Macrantherae*, 45–48° for the *Piperitales* and 51–54° for the *Fraxinales* and *Longitudinales*. Variation within a species may be sporadic and the result of mutation and local hybridization, or clinal. When clinal it is related to differences in frost incidence, the more glaucous populations occurring in frostier localities. The clines represent changes in allelic frequencies at one or more loci controlling wax development, and result from natural selection.

149. ARTAZA, J. E. Génétique et sélection des peupliers espagnoles. **[Genetics and selection of Spanish Poplars.]** [*Pap.*] *8th Sess. int. Poplar Comm., Madrid 1955*, No. *FAO/CIP/75-K Add.* 1, 1955. pp. 6. [F.]

A short account of the indigenous Poplars and natural hybrids, and the hybrid American Poplars used for breeding in Spain.

150. SHARMA, A. K., and SARKAR, S. K. **A new technique for the study of chromosomes of Palms.** *Nature, Lond.* 176 (4475), 1955 (261–2). 7 refs. [Department of Botany, Calcutta University.]

A number of alkaloids were tested for the fixation of Palm chromosomes, and excellent results were obtained with aesculine, a derivative of *Aesculus hippocastanum*, which appears to have solved the

long-standing difficulty of study of the chromosomes of Palms, other methods of fixation having all proved ineffective.

151. MEHRA, P. A., and KHOSHOO, T. N. **Cytology of conifers.** *Sci. & Cult.* 21 (1), 1955 (46). E.M.B.

Presents a list of chromosome numbers of 47 coniferous species.

152. CHERUBINI, C. Números de cromosomas de algunas especies del género *Prosopis* (Leguminosae—Mimusoideae). [**Chromosome numbers of some species of the genus *Prosopis*.**] *Darwiniana, B. Aires* 10 (4), 1954 (637–43). 15 refs. [Span.span.] A.P.B.

Presents a list of chromosome numbers of 21 species, 16 of which are native to Argentina.

168. Histology

See also Nos. 133, 233, 784 *et seq.*

153. LA RUE, C. D. **Cultures of plant endosperms.** *Abstr.* in *Anatomical Record, Philadelphia* 121 (2), 1955 (473). L.S.

Endosperms of 8 species, including *Ginkgo*, *Taxus*, and *Thuja*, were cultivated *in vitro*. Nutrient requirements, manner of growth and cytological behaviour are discussed.

154. REINERT, J. **The importance of oxidation enzymes in the cultivation of conifer tissues.** *Abstr.* in *Anatomical Record, Philadelphia* 121 (2), 1955 (476). L.S.

Growth of conifer tissue *in vitro* can be obtained only by satisfactory control of a series of metal-dependent enzymes which affect the availability of growth hormones. The various ways in which this can be done are discussed.

155. BALL, E. **Studies of the nutrition of the callus culture of *Sequoia sempervirens* [with discussion].** *Année biol.* (*n.s.*) 31 (1/4), 1955 (81–105). 27 refs. [E.] O.R.S.

The three sugars found in green shoots of *S. sempervirens* growing from burls were sucrose, glucose and galactose. Callus grown on a medium containing any one of these made the other two. Callus on some other sugar on which it could grow (e.g. mannose, lactose) made the 3 normal sugars and took up the foreign sugar. Callus grown on raffinose or on galactose contained the 3 normal sugars plus both raffinose and galactose, and the media after 2 months contained the same 5 sugars. A sucrose medium after 2 months contained the 3 normal sugars; a glucose, fructose, or mannose medium after 2 months contained glucose, fructose and mannose respectively; and a lactose medium contained the 3 normal sugars and lactose. Callus was grown on media containing one of 9 sugars and the areas of callus and of tracheid groups after different periods were measured. Differences between callus areas for the 9 sugars were not significant but those between tracheid-group areas were significant, callus grown on galactose and raffinose containing the largest amount, and that grown on maltose and melibiose the least. Results of studies on the absorption of radioactive materials by the callus are discussed. [Cf. *For. Abstr.* 16 (No. 126).] Autoradiographs showing the accumulation of different radio-isotopes in the tissues are given. Results suggest that the callus does not use exclusively as metabolite the sugar in the culture medium. C-containing compounds are transported from the inoculum straight to the new growth. The occurrence of secondary C^{14} compounds in individual cells or groups of cells more or less widely separated from each other by non-radioactive parenchyma, suggests that growth centres are present in the callus.

156. BALL, E. **Some effects of radioisotopes on the callus culture of *Sequoia sempervirens*.** *Abstr.* in *Anatomical Record, Philadelphia* 121 (2), 1955 (466). L.S.

157. JACQUIOT, C. Formation d'organes par le tissu cambial d'*Ulmus campestris* L. et de *Betula verrucosa* Gaertn. cultivés *in vitro*. [**Formation of organs by cambial tissue of *U. campestris* and *B. verrucosa* grown *in vitro*.**] *C.R. Acad. Sci., Paris* 240 (5), 1955 (557–8). 4 refs. [F.] O.R.S.

Cultures of both species produced roots after one transplanting. Subsequent transplantings appeared to have no effect on root formation by *B. verrucosa*, but root formation by *U. campestris* decreased after the 3rd and was only sporadic after the 5th. Neither species in culture formed buds, although in previous cultures, without transplanting, *U. campestris* had done so.

17. Systematic Botany

158. DAYTON, W. A. **Historical sketch of U.S. Forest Service botanical activity, 1905–54.** *J. For.* 53 (7), 1955 (505–7).

172.8. Eumycetes (True Fungi)

See also Nos. 47, 225, 552 *et seq.*, 948 *et seq.*

159. DENNIS, R. W. G. **The larger fungi in the North-West Highlands of Scotland.** *Kew Bull.* 1955 (1), (111–26). 6 refs.

Annotated lists of species found in native Birch woods, Alder/Willow swamps, conifer plantations (chiefly *Pinus sylvestris*), moorland and grassland, along with taxonomic notes on some critical fungus species. The region lies beyond the range of most native tree species, thus simplifying the problem of recognizing associations of particular terrestrial fungi with particular tree species.

174. Spermatophyta, Seed-Plants in General. Floras and Check-Lists

See also No. 1080.

160. WALKER, E. H. **Important trees of the Ryukyu Islands.** *Special Bulletin, United States Civil Administration of the Ryukyu Islands* No. 3, 1954. pp. vi + 350. 42 refs. [Jap.E.]

Some 200 trees and Bamboos are included with, for each species, a brief description, usually illustrated, and notes on distribution, habitat, wood properties and uses. There are separate keys to trees and Bamboos, keys to individual species under

families and genera, and indexes to scientific, English and Japanese names (including one in Romaji script).

161. TÄCKHOLM, V., and DRAR, M. **Flora of Egypt. Vol. III. Angiospermae, part Monocotyledones: Liliaceae—Musaceae.** *Bulletin of the Faculty of Science, Cairo University* No. 30, 1954. pp. 647. Many refs. [E.]

Cf. *For. Abstr.* 13 (No. 1881).

162. KEAY, R. W. J. **Revision of the 'Flora of West Tropical Africa'—VII.** *Kew Bull.* 1955 (1), (137–41).

Includes the reduction of *Gymnorinorea* (*G. abidjanensis*) to *Decorsella* (*D. paradoxa*), wrongly attributed by Chevalier to the Urticaceae, and *Dichapetalum guineense* comb. nov. (*D. flexuosum*, *D. rowlandii*) based on *Ceanothus? guineensis* DC.

163. PARDY, A. A. **Notes on indigenous trees and shrubs in Southern Rhodesia.** *Reprs.* from *Rhod. agric. J.* 52 (3), 1955. Each pp. [1] + 2 or 3 plates. (*Bull. Minist. Agric. Lds., S. Rhod.* Nos. 1822–5.)

Hymenodictyon floribundum, *Psorospermum febrifugum*, *Randia vestita*, and *Vangueria longicalyx*.

164. HUECK, K. Waldbäume und Waldtypen aus NW-Argentinien. **[Forest trees and forest types of N.W. Argentina.]** Fritz Haller Verlag, Berlin-Grunewald. 1954. pp. 31. [G.] [Departamento de Botânica, Univ. de São Paulo, Brazil.]

Extracts from an as yet uncompleted work, giving (*a*) for ca. 50 representative or economically important species, their local names, description and notes on distribution, silvicultural characters, and practical importance; and (*b*) a brief review of the forest types of the chaco, transitional forest, subtropical rain-forest, upper and high montane forest, and gallery forests. [Cf. *For. Abstr.* 17 (No. 271).]

174.2/.7. Gymnosperms

See also Nos. 130, 134, 151, 786.

165. MANUPUTTY, D. N. Keluarga *Agathis* di Indonesia. **[The genus *Agathis* in Indonesia.]** *Rimba Indonesia* 4 (3/5), 1955 (132–88). 68 refs. [Jav.e.]

Describes 13 *Agathis* spp., found in Kalimantan [Borneo], Sulanvesi [Celebes] and the Moluccas, giving particulars of tree size, leaves, fruits, copal tapping, and distribution. The natural forests are found in a wet climate, on fertile, pervious soils, and usually grow in mixture. The main uses of the copal, the need for better methods of tapping to avoid killing the trees, and possible uses of the wood are discussed. Protection of the young trees and of the larger pure stands, and research on natural regeneration, thinning, exploitation and utilization are necessary.

166. GRAY, N. E. **A taxonomic revision of *Podocarpus* IX. The south Pacific species of *Eupodocarpus* subsection F.** *J. Arnold Arbor.* 36 (1/2), 1955 (199–207). 8 refs.

Contains descriptions of *Podocarpus longefoliolatus* and *P. decumbens*, both from New Caledonia, and *P. decipiens* from Fiji, the last being the only one described as producing lumber. [Cf. *For. Abstr.* 14 (No. 3096).]

167. GROVES, G. R. **The Bermuda Cedar.** *World Crops* 7 (9), 1955 (343–7). O.R.E.

A description of *Juniperus bermudiana*, its wood, its original distribution and uses, its recent near-extermination through imported scale insects, the work of the Commonwealth Institute of Biological Control in combating the pest, and the Government's reforestation measures.

168. HALL, M. T. **Comparison of Juniper populations on an Ozark glade and old fields.** *Ann. Mo. bot. Gdn.* 42 (2), 1955 (171–94 + 2 plates). 19 refs. O.B.D.

In the north-eastern Ozarks, *Juniperus virginiana* is represented by the Ozark race (introgressants from *J. ashei*) on bluffs, glades and most old fields. Occasionally the northern race is found locally with a little admixture of the Ozark race. Three populations of *J. virginiana* in the N.E. Ozarks were studied in detail in order to compare their variation patterns and habitats. The evidence suggests that the 3 populations, Glade, Cedar Hill and Old Field, are distinct and differ more or less proportionately to the difference in their habitats. The Glade (Ozark race) is the most southwestern in affinity, more closely resembling a population and habitat of *J. ashei*. Cedar Hill (Ozark race) is intermediate between Glade and typical Red Cedar and occurs on old fields that are in good condition, or, farther south-west from Gray Summit, Missouri, on more worn-out lands. The Old Field (northern race with a little mixing from the Ozark race) occurs on worn-out acidic and sandy lands in the vicinity of St. Louis and north-eastward. Distribution in the age classes in the Junipers indicates that the bluffs, knobs and glades have been colonized longest, followed by the old fields, supporting the Ozark race, and, last, the worn-out sandy, acidic fields supporting youthful colonies of the Northern race. An explosive expansion of Juniper colonization resulting from man's activities seems to have occurred within the last 100 years, growing progressively as land has been worn out and abandoned. *From author's summary.*

169. SAATÇIOĞLU, F. Eine neue Varietät von *Pinus nigra* Arnold (*Pinus nigra* Arnold var. *şeneriana* Saatçioğlu var. nov.). **[A new variety (var. *şeneriana*) of *P. nigra*.]** *Z. Weltforstwirt.* 18 (1), 1955 1–6). [G.e.f.]

The new variety, distinguished from *P. nigra* var. *caramanica* with which it occurs, by its low branching, round crown, and smaller cones and seeds, was found at 1000–1100 m. alt. about 20 km. E. of Bolu in N.W. Anatolia.

170. MARTIN, E. J. *Sequoia*—eine gehölzkundliche Betrachtung. **[*Sequoia gigantea*—dendrological notes.]** *Holz-Zbl.* 81 (83), 1955 (1001–2). 16 refs. [G.]

A compilation of various data concerning *S. gigantea* (associated tree, shrub and plant species, physical and mechanical properties of wood and uses).

171. ARNOLD, C. A., and LOWTHER, J. S. **A new Cretaceous conifer from northern Alaska.** *Amer. J. Bot.* 42 (6), 1955 (522–8). 6 refs. O.B.D.

Parataxodium wigginsii gen. et sp. nov. Characters of *Taxodium* and *Metasequoia* are about equally balanced in *Parataxodium*, which may represent the ancestral stock of these two genera.

176.1. Dicotyledons

See also Nos. 136, 148–9, 152, 778, 785, 787–90.

172. PAŞCOVSCHI, S. Caracterele diferenţiale ale stejarului brumăriu. [**Distinguishing characteristics of *Quercus pedunculiflora***.] *Rev. Pădurilor* 70 (2), 1955 (50–2). [Rum.]

Discusses the principal characters distinguishing this species from *Q. robur*: thick tomentum on the back of the leaves, a characteristic rhytidome, and later date of flowering and fruiting.

173. MILLER, G. N. **The genus *Fraxinus*, the Ashes, in North America, north of Mexico.** *Mem. Cornell agric. Exp. Sta.* No. 335, 1955. pp. 64. 142 refs.

Describes 12 species and some possible hybrids and gives tabular keys to: (*a*) sections and subsections of *Fraxinus*, (*b*) subsection *Melioides*, and (*c*) N. American species of *Fraxinus* (by leaf).

174. GARDNER, C. A. **Trees of Western Australia. Nos. 31 to 34—Four Bloodwoods from the Kimberleys (*Eucalyptus latifolia* F. Muell.: *E. foelscheana* F. Muell,: *E. lamprocalyx* W. F. Blakely: and *E. cliftonia* W. V. Fitzg.).** *Bull. For. Dep. W. Aust.* No. 2254, 1955. pp. 6. (*Repr.* from *Journal of Agriculture of Western Australia, Perth* (*Ser.* 3) 4 (2), 1955 (214–7).)

175. Bibliografia sobre el eucalipto. [**Bibliography of *Eucalyptus***.] *Boletín bibliográfico, Ministerio de Agricultura y Ganadería de la Nación, Buenos Aires* 21 (2), 1954 (52–69). [Span.]

A comprehensive, classified list of world literature, dating mainly from the beginning of the century.

176. VOLKMANN, J. H., and MEYER-UHLENRIED. Bibliographie des internationalen Pappelschrifttums. [**Bibliography of international literature on Poplars.**] Nationale Pappelkommission, Kronprinzenstr. 15, Bonn. 1954. pp. [4] + xxv + 202. [G.]

In addition to the main list of 1268 titles arranged according to the Oxford System of Decimal Classification, the work contains a concordance of the main heads of that system with the Flury System and 4 appendixes: (1) the bibliography from S. S. Pauley's 'Forest tree genetics research: Populus L'; (2) subject index; (3) authors index; and (4) list of periodicals and serials cited, with abbreviations. Special efforts were made to cover the literature as completely as possible from 1951 on; references before that year are taken from the more comprehensive of recent works on Poplars.

177. JOACHIM, H. F. Probleme der Pappelforschung. [**Problems of Poplar research.**] *Arch. Forstw.* 3 (5/6), 1954 (487–502). 29 refs. [G.]

A detailed review of the tasks awaiting Poplar research. Subjects covered are taxonomy, site factors, yield, wood technology (chemistry and physics), injuries, silviculture, uses, effect on environment, and breeding.

178. RÉGNIER, R. De l'origine des peupliers. [**The origin of the Poplars.**] [*Pap.*] *8th Sess. int. Poplar Comm., Madrid 1955*, No. *FAO/CIP*/79-*B*, 1955. pp. 5. [F.]

Gives a short account of fossil species, and discusses the evolution of the various sections of *Populus*.

179. FRONTERA MARQUÉS, B. Le peuplier blanc d'Alfambra. [**The White Poplar of Alfambra.**] [*Pap.*] *8th Sess. int. Poplar Comm., Madrid 1955*, No. *FAO/CIP*/75-V. *Add.* 7. 1955. pp. 5. [F.]

Describes a Poplar (probably *P. canescens*) that occurs in some abundance in this region of Aragon. It is recommended that it should be tried for planting on cold sites and alkaline soils in other parts of Spain. It suckers freely.

180. SABETI, H. Le peuplier en Iran. [**The Poplar in Persia.**] Imp. Bank, Bazárgáni, Iran. 1955. pp. 96 + 10. [Pers.f.]

Describes the species grown in Persia (*Populus euphratica, P. alba, P. hybrida* M.B., *P. nigra, P. nigra* var. *italica*), their silvicultural characters, timber properties and uses, and lists insect pests and diseases. Photographs (78) have French legends.

181. TUCOVIĆ, A. Prilog poznavanju berlinske topole (× *Populus berolinensis* Dippel). [**Notes on *P. berolinensis***.] *Šumarstvo* 8 (6), 1955 (338–44). 11 refs. [Croat.e.g.]

A general description, with some details relating to *P. berolinensis* in Serbia.

182. KENG, H. **The Melostomataceae of Taiwan.** *Quart. J. Taiwan Mus.* 8 (1), 1955 (17–58). [E.]

Keys to Formosan genera and species, with descriptions and drawings.

183. KENG, H. **Notes on the phytogeography of the Melostomataceae of Taiwan.** *Quart. J. Taiwan Mus.* 8 (1), 1955 (59–61). 9 refs. [E.]

184. WALKER, E. H. **Concerning the Myrsinaceae ('Ardisiaceae') of Japan. IV.** *Bot. Mag., Tokyo.* 67 (797/798), 1954 (247–55). 32 refs. [E.] I.M.I.

Generic segregation in the sub-family Myrsinoideae. A critical rejection of Nakai's division into 7 genera (key) and the allocation of the species involved all to *Myrsine*, which with *Rapanea* forms the tribe *Myrsineae*. [Cf. *For. Abstr.* 16 (No. 3849).]

185. KALKMAN, C. **Revision of the Burseraceae of the Malaysian area in a wider sense VIa, VII–IX.** *Blumea* 7 (3), 1954 (498–552). 39 refs. [E.] O.R.S.

Garuga, Triomma, Dacryodes, and *Santiria*.

186. WYATT-SMITH, J. **The Dipterocarpaceae of Brunei, N. Borneo and Sarawak. II. *Dryobalanops*.** *Malay. Forester* 8 (3), 1955 (145–56). 4 refs.

Nomenclature, distribution and botanical description of the 9 known species of *Dryobalanops*.

187. SLEUMER, H. **Florae malesianae precursores VII. New Malaysian Flacourtiaceae.** *Blumea* 7 (3), 1954 (484–97). [Lat.] O.R.S.

Casearia spp., *Flacourtia* spp., *Hydnocarpus tenuipetala* sp. nov., *Pseudometea* gen. nov., *Ryparosa* spp.

188. ASSEM, J. VAN DEN, and KOSTERMANS, A. J. G. H. **Revision of the Sapotaceae of the Malaysian area in a wider sense. IVa. *Ganua* Pierre ex Dubard. (Additional notes.)** *Blumea* 7 (3), 1954 (581–3). [E.] O.R.S.

G. kingiana varieties, *G. motleyana* and *G.? palembanica* comb. nov.

189. KOSTERMANS, A. J. G. H. Sedjenis onglen jang terapung diatas air. [**A species of Ironwood that floats in water.**] *Rimba Indonesia* 4 (1/2), 1955 (60–2). [Jav.e.]

Eusideroxylon melagangai has been found in West Kutei and in W. Borneo, associated with *E. zwageri*. Both species have 4-angled young branches, a characteristic previously regarded as distinguishing *E. melagangai*. The wood of the two species is dissimilar. Drawings of leaves and fruit are given.

190. MELVILLE, R. **A new *Syzygium* from Samoa.** *Kew Bull.* 1955 (2), (293–5).

S. hebephyllum sp. nov., a small tree.

191. BRENAN, J. P. M. **Notes on Mimosoideae. I.** *Kew Bull.* 1955 (2), (161–92). Many refs.

Taxonomic notes on: (1) *Entada*, including *E. spinescens* sp. nov. from Tanganyika, and notes on other African species, especially those having giant pods (*E. gigas* and *E. pursaetha*). (2) *Piptadenia* and related genera, *Piptadenia* being divided among the 8 genera *Pityrocarpa*, *Goldmania* and *Piptadenia* sensu stricto (all Central or S. American), *Indopiptadenia* gen. nov. (based on *P. oudhensis* Brandis), *Monoschisma* gen. nov. (S. American), *Piptadeniastrum* gen. nov. (based on *P. africana*), *Newtonia* (African and S. American, *N. paucijuga* comb. nov. being the valid name for *Cylicodiscus battiscombei*) and *Anadenanthera* (tropical American), with many new combinations in the various segregated genera. (3) *Calpocalyx* and *Pseudoprosopis*, *C. sericeus* being transferred to the latter genus. (4) *Mimosa*: infraspecific taxa in *M. pudica*; *M. mossambicensis* nom. nov. (*M. violacea* Bolle); (5) *Albizzia*: new African infraspecific taxa.

192. BRUCE, E. A. **Notes on the African species of the genus *Anthocleista* Afzl. ex R.Br.** *Kew Bull.* 1955 (1), (45–57).

Key to, and taxonomic notes on, all the large-leaved tree species of the genus: 6 'good' species are recognized and brief notes are included on 3 doubtful species.

193. BRUCE, E. A. **Notes on African *Strychnos*: I: II.** *Kew Bull.* 1955 (1), (35–44; 127–9). 6 refs.

(I) A revision of the section *Spinosae*, reducing the number of species recognized to 3, viz. *S. congolana*, *S. cocculoides* and *S. spinosa* (the last with 3 subspecies). Distribution maps and a key to species and subspecies are included.

(II) Reduces 10 described species of the section *Ligustroides* to one variable, widely distributed species, under the oldest specific epithet *S. henningsii*.

194. LEWIS, J. **Notes on *Cassipourea* Aubl. in Africa.** *Kew Bull.* 1955 (1), (143–59).

Includes extensive reductions to synonymy or to varietal status, occasioned by the discovery of failure in the correlation of characters and of variation beyond the previous circumscription of species, with chief reference to E. African material. Variation and the poor correlation of characters are dealt with at some length for the subgenus *Dactylopetalum*, where only the one widespread, variable species *C. gummiflua* is recognized (with key to varieties).

195. FRIES, R. E. **Three new Annonaceae from Panama.** *Ann. Mo. bot. Gdn.* 42 (2), 1955 (151–2). O.B.D.

Includes a new tree species, *Anaxagorea allenii*.

18. Plant Ecology

196. Colloque sur les régions écologiques du globe. [**International conference on ecological regions of the world.**] *Année biol. (n.s.)* 31 (5/6), 1955 (245–478). [F.] O.R.S.

Includes papers on: The water factor in arid regions and its effect on vegetation in subtropical countries (*H. Walter*); the use of water by vegetation in temperate climates (*A. Pisek*); temperature as a factor affecting distribution of vegetation on mountains (*P. Ozenda*); nomenclature and classification of vegetation types in French West and Equatorial Africa (*J. L. Trochain*); man's effect on the natural environment (*R. Heim*); ecological studies on vegetation of tropical Africa (*P. Duvigneaud*); ecology and cartographical representation of equatorial and humid tropical forests (*G. Mangenot*); and new maps of S. American vegetation and their significance for agriculture and forestry (*K. Hueck*).

197. SETH, S. K. **Applied ecology in forestry.** *Indian For.* 81 (8), 1955 (456–64).

Discusses the subject in very general terms, but with a few illustrations from India of e.g. forest types.

181. Mode of Life, Autecology. Silvicultural Characters of Trees

See also Nos. 165, 180, 309, 781.

198. **New Zealand Kauri.** *Timb.Tr. J.* 214 (4119), 1955 (89–90).

Notes on the conservation and regeneration of *Agathis australis* with data on total and clear-bole height, girth, merchantable volume and crown spread of some famous specimens.

199. ZAPRJAGAEVA, V. I. Turkestanskaja arča v Tadžikistane. [***Juniperus turkestanica* in Tadzhikistan.**] *Priroda, Moskva* 44 (6), 1955 (102–4). [Russ.] A.P.B.

Very brief notes on distribution and ecology, habit variations and growth rate, and value in

protecting high mountain slopes from erosion. Under the most favourable conditions the trees may grow in 600–700 years to 10–12 m. high and 100–120 cm. diameter. It is highly adapted to its habitat and should not be replaced by introduced species that are less so.

200. SUSMEL, L. Conservazione e miglioramento delle abetine delle Alpi orientali. **[The preservation and improvement of Spruce stands in the eastern Alps.]** *Repr.* from *Atti del Congresso Nazionale di Selvicoltura, Firenze 1954*, 1955 (331–70 + 6 photos). 20 refs. [It.]

Summarizes the author's studies on the ecology, regeneration, and increment of *Picea abies* in the Italian Alps. [Cf. *For. Abstr.* 13 (Nos. 1088, 3730); 14 (Nos. 228, 1451); 15 (Nos. 1189, 2282).]

201. ČERNJAVSKI, P. Belijat bor v Bălgarija. **[*Pinus sylvestris* in Bulgaria.]** *Gorsko Stopanstvo* 10 (6), 1954 (257–62). 16 refs. [Bulg.?] From *abstr.* in *Prehl. lesn. Lit.* 6 (2), 1955 (No. 449). [Cz.] P.R.

A comparison of the habitat of *P. sylvestris* in Bulgaria with that in the rest of Europe; its site requirements, appearance in Bulgaria, increment measurements, and some morphological characters.

202. LAMPRECHT, H. Ceiba. **[*Ceiba pentandra.*]** *Bol. Ingen. for. Univ. Los Andes* 2 (8), 1955 (33 + 1 photo). [Span.]

Notes on the tree, its distribution in Venezuela, and its silvicultural requirements.

203. LAMPRECHT, H. Pardillo. **[*Cordia alliodora.*]** *Bol. Ingen. for. Univ. Los Andes* 2 (7), 1955 (41 + 1 photo). [Span.]

Notes on the tree, its distribution in Venezuela and its silvicultural requirements.

204. HAMILTON, L. S. **Silvicultural characteristics of American Beech [*Fagus grandifolia*].** *Beech Utiliz. Ser. Ntheast. For. Exp. Sta.* No. 13, 1955. pp. 39. 47 refs.

205. KOZDON, P. Die *Nothofagus*-Arten der Kordillere. **[The *Nothofagus* species of the Cordillera.]** *Z. Weltforstwirt.* 18 (1), 1955 (7–16). 14 refs. [G.e.f.]

Gives descriptions of 11 species from Argentina and Chile, their habitat, climatic and soil requirements, timber and its uses, and recommends extensive trials in Europe of *N. obliqua*, *N. procera* and *N. dombeyi*, which the author considers promising for mixtures with conifers on sites unsuitable for Beech.

206. DAKOW [DAKOV], M. P. Biologische Besonderheiten der Eiche und Massnahmen zur Verbesserung ihrer Nachzucht. **[Biological characteristics of Oak and measures for improving its cultivation.]** Akademie-Verlag, Berlin. 1955. pp. 130 + plate. 151 refs. [G.] Price *DM* 9·50.

A translation direct from the original (in Russian) published by the Bulgarian Academy of Sciences [already noticed, as a translation into Czech, in *For. Abstr.* 15 (No. 2323)].

207. KERESZTESI, B. Az akác erdömüvelési tulajdonságai és erdögazdasági jelentösége a Magyar Alföldön. **[Silvicultural characteristics and importance of Robinia on the Hungarian plain.]** *Erdö* 3 (6), 1954 (181–9). [Hu.]

The most productive stands of *R. pseudoacacia* occur on young or slightly podzolized brown forest soils which provide suitable conditions for the development of a vigorous root system. Calcareous, sandy, prairie soils and sands may carry good stands of this otherwise unexacting tree, provided they possess a loamy layer in the subsoil to prevent undue droughtiness. Heavy soils of poor humus content, in which root growth is impaired, are less suitable. Robinia coppice may attain heights similar to those of trees of seedling origin (11–13 m. in eight years). Planting is preferably done in mixture with Oak, or with Scots Pine on droughty soils. Owing to its rapid growth and high production of timber under good light conditions, Robinia is eminently suitable for the outside rows of Oak shelterbelts, possibly in double rows. While 10- and 20-year-old trees on suitable soils may attain heights 4·8 times and 2·6 times that of Oak of the same age, their timber yield at a felling age of 30 years will amount to 402 cu.m./ha. as compared with 230 cu.m. for Oak and 168 cu.m. for Scots Pine.

208. MATHAUDA, G. S. ***Pongamia pinnata* (L.) Pierre (syn. *Pongamia glabra* Vent.) fam. Leguminosae—Papilioneae.** *Indian For.* 81 (9), 1955 (563–5). 12 refs.

Notes on distribution, morphology, silvicultural characters and uses.

209. HEATHER, W. A. **The Kamarere forests of New Britain.** *Emp. For. Rev.* 34 (3), 1955 (255–78 + 8 photos). 29 refs.

The environmental conditions under which *Eucalyptus deglupta* occurs naturally in New Britain are discussed. Silvicultural characteristics and requirements of the species are outlined. A silvicultural system and policy of management are proposed. Information on growth, yield, major properties and uses of the timber is summarized. *Author's summary.*

181.1. Distribution, Natural Range

See also Nos. 242, 245.

210. FOX, W. B., and SHARP, A. J. La distribución de *Fagus* en México. **[The distribution of *Fagus* in Mexico.]** *Boletín Sociedad Botánica de México, Mexico* No. 17, 1954 (31–3). [Span.] L.S.

Presents a list of herbarium material with a distribution map of *Fagus mexicana*.

181.2. Atmospheric Relations. Acclimatization

See also Nos. 14, 133, 148, 228, 232, 299–315.

211. KRASJINA, V. J. **Transpiration and shade-tolerance of trees.** *Abstr.* in *Bull. ecol. Soc. Amer.* 36 (2), 1955 (51). A.P.B.

Certain tree species may be shade-intolerant in some climates and shade-tolerant in other (usually relatively drier) climates. Different transpiration

conditions are mainly responsible for such variations. A species growing as a climatic climax species in one climatic region may be shade-tolerant there, but shade-intolerant in another more humid, possibly because of insufficient transpiration under the canopy of other trees. Examples of such species are *Pseudotsuga taxifolia*, *Pinus contorta*, *P. lambertiana*, *P. monticola*, *Libocedrus decurrens*, *Abies concolor*, *A. magnifica* and *Picea engelmannii*. All these require exposure to the sun to obtain high transpiration rates in more humid climates. In drier climates their transpiration in the shade of other woody plants is reduced, which may favour their natural regeneration. *Larix occidentalis*, which is considered very shade-intolerant, may require the shade of *Pinus ponderosa* for its regeneration in certain dry climates. Relatively lower transpiration in the shade of shrubs may become important for natural regeneration of *P. ponderosa* at its timberline, where the climate becomes too dry and warm.

212. DECKER, J. P. **The uncommon denominator in photosynthesis as related to tolerance.** *For. Sci.* 1 (2), 1955 (88–9). 8 refs.

The author complains of the lack of caution in interpreting the ecological significance of photosynthesis as expressed in terms of unit leaf area or weight [cf. *For. Abstr.* 11 (No. 966); 12 (No. 2820)]. Of the two assumptions (*a*) that the total amount of photosynthesis for a given degree of plant behaviour divided by the total leaf area yields a constant value irrespective of species, and (*b*) that maximum rates of photosynthesis have the same ecological value for different species, (*a*) appears to have no supporting evidence and (*b*) can be vigorously supported only for one kind of behaviour—dry weight increment. There probably cannot be a universal denominator that will translate measurements of photosynthesis directly into reliable ecological indices (e.g. successional tendency), because the aspects of ecological success (dry-weight increment, growth, reproduction, survival, drought-resistance etc.) are not necessarily correlated closely and positively.

213. ROUSSEL, L. Essences d'ombre, essences de lumière. [**Shade-bearers and light-demanders.**] *Bull. Soc. for. Franche-Comté* 28 (6), 1955 (279–89). [F.]

Discusses the factors involved in the varying reaction to light of e.g. Spruce and Fir, and the interactions of light and growth regulators as a possible explanation of the differential growth (height, stem form etc.) of open-grown trees and trees growing in dense stands. [Cf. *For. Abstr.* 16 (No. 199).]

214. SHAPIRO, S. **Light inhibition of roots on stem segments of the Lombardy Poplar.** *Abstr.* in *Plant Physiol.* 30 (Suppl.) 1955 (viii–ix). O.R.E.

When cuttings from the stem of a Lombardy Poplar were suspended in a dark damp chamber for 5–6 days, the root primordia emerged normally. Exposure to continuous light, however, completely inhibited them. Exposure to light for 1% of the time on a short, repeating, 6-minute cycle also resulted in total inhibition, whereas light for 1% of the time on a 24-hour cycle resulted in 50% inhibition. Exposure to a single 24-hour illumination, at various times before the appearance of the roots, indicated that inhibition is more pronounced when the light is applied on the third day. Growth once inhibited by light could not be restarted by prolonged darkness. Segments cut from trees severed from their root systems after 2 weeks of normal cyclical illumination showed complete inhibition. It is suggested that the protective mechanism which makes possible segmental root development despite the daily exposure to light of growing trees, resides in some product of the root system.

215. DOWNS, R. J. **Photoperiodic growth responses of seedlings and cuttings of several woody plants.** *Abstr.* in *Plant Physiol.* 30 (Suppl.), 1955 (xxi). O.R.E.

Rooted cuttings of *Weigela florida* var. *variegata*, and seedlings of *Catalpa bignonioides*, *Acer rubrum*, *Ulmus americana* and others, grown on several photoperiods, were studied. Expansion of new leaves stopped on short (8-hour) and continued on long (16-hour) photoperiods. *Weigela* cuttings on 8-hour photoperiods stopped elongation and produced a large terminal bud. The axillary buds enlarged markedly and the internodes took on a brown, mature appearance. The leaves became leathery in texture and showed tip and marginal burn. Seedlings of *Catalpa* and *Acer* also stopped elongation after about one month of 8-hour photoperiods, but some *Ulmus* individuals continued even after 6 months. The terminal and enlarged axillary buds of *Weigela* produced by short photoperiods resumed growth after 10 days of 16-hour illumination. Interruption of the long dark periods associated with winter was similarly effective. Growth of arrested *Catalpa* seedlings was not resumed on return to long days. When the leaves of *Weigela* were removed, bud growth quickly occurred regardless of length of photoperiod, but in short photoperiods shoot growth from the buds stopped as soon as the leaves had expanded appreciably. Removal of leaves from *Catalpa* did not result in growth of buds.

216. LARCHER, W. Die Kälteresistenz mediterraner Immergrüner und ihre Beeinflussbarkeit. [**Frost resistance in Mediterranean evergreens and its susceptibility to modification.**] *Planta* 44 (6), 1954 (607–35). Many refs. [G.g.] O.B.D.

In winter the following temperatures could be sustained for ca. 3 hours without injury: −7° C. by leaves of *Nerium oleander*; −9 to −10° by leaves of *Laurus nobilis* and *Arbutus unedo*; −10 to −11° by needles of *Pinus pinea* and leaves of *Viburnum tinus* and *Olea europea* ssp. *sativa*; −11 to −12° by leaves of *Quercus ilex*, *Chamaerops humilis* and *Trachycarpus fortunei*; −14° by shoots of *Cupressus sempervirens*; −15° by needles on spurs of *Cedrus atlantica* and *C. deodara*; and −18° by leafless green shoots of *Citrus trifoliata*. In summer, frost resistance weakens in varying degree in different species. On the average −4 to −5° was the level below which injury to both the current and previous years' growth was liable to occur, though *Cupressus sempervirens* could still withstand a temperature of −7°, both Palms −10° and *Citrus* bark −12°. No parallel fluctuations in osmotic values were found.

Increased frost resistance in winter must, therefore, depend in part on physico-chemical changes in the protoplasm. This was confirmed by attempts to condition plants to frost-hardiness by subjecting them to different temperatures. No increase in frost-hardiness in summer could be achieved, but a lowering of resistance in winter was brought about in all plants except *Chamaerops humilis* and *Trachycarpus fortunei* by keeping them for 4 days in a room at 20° C. None of the plants, however, reached their summer level of frost sensitivity.

217. PARKER, J. **Annual trends in cold hardiness of Ponderosa Pine and Grand Fir.** *Ecology* 36 (3), 1955 (377–80). 25 refs. [University of Idaho, Moscow, Idaho.]

Needles of *Pinus ponderosa* and *Abies grandis* were brought from their natural habitat, cut from the twigs, and cooled and warmed to various temperatures at about 1° C. change in temperature per hour. A specially designed cold chamber was used, having a Freon compressor and copper coils wound around the insulated walls. After cooling and warming the needles, the tetrazolium-chloride test was used to determine viability. Results showed a slow increase in hardiness in late summer and early autumn and then a sharp increase in hardiness in early November, coinciding with several nights of temperature near or below freezing. During January, needles withstood at least −55° C. without damage. Hardiness then showed a general decrease during a warm February but even by late May had not reached the degree of sensitivity of the new needles that appeared at that time.

Differences appeared among different ages in both species, but no appreciable ones between the two species, except possibly in May. In the autumn, the current season's foliage was less resistant than the previous season's, but in spring their sensitivity was reversed, the one-year-old needles being more resistant than the two-year-old. New needles in spring were slightly less resistant than older needles in both species. *From author's summary.*

181.3. Water, Soil and Root Relations (including Bacterial and Mycorrhizal Symbiosis)

See also Nos. 23, 24 *et seq.*, 49–52, 128, 159, 207, 214, 367, 369, 393–4, 434, 508, 809.

218. DALE, J., MCCOMB, A. L., and LOOMIS, W. E. **Chlorosis, mycorrhizae and the growth of Pines on a high-lime soil.** *For. Sci.* 1 (2), 1955 (148–57). 11 refs.

Pinus banksiana was grown from seed in pots of calcareous silt loam of pH 8·2 from the C_1 horizon to determine whether the frequently observed chlorotic condition of field-planted Pines could be corrected by treatment with NPK fertilizers (*a*) alone, (*b*) in various combination with each other and with micronutrients, (*c*) by acidification of the soil, (*d*) by inoculation with humus from a healthy Pine plantation, (*e*) by treatment with Fe from different sources and at different levels. Only (*d*) produced normal growth, and the seedlings thus treated were the only ones to possess mycorrhizae. With (*c*), a significant increase in growth was obtained, but seedlings were abnormal and would probably not have survived the second year. No Fe treatment, alone or in combination with NPK, prevented chlorosis in the absence of (*d*). The need is emphasized of a study of mycorrhizal fungi in relation to organic matter, antibiosis, microbial competition, soil reaction, nutrient levels, water, air and heat.

219. BAUER, F. Roteiche und Kalk. [***Quercus borealis* and lime.**] *Holz-Zbl.* 81 (86), 1955 (1033–4). [G.]

Unlike Kleiber [*Allgemeine Forstzeitschrift* 33/34, 1954, and 14, 1955], the author affirms that the effect of limey soil on *Q. borealis* depends to a large degree on the soil structure, water supply and humus content, so that, given other favourable conditions, the high $CaCO_3$ % cannot prevent the growth of this species.

220. WOOD, G. H. S., and CHENERY, E. M. **Regeneration of *Chlorophora excelsa* (Mvule) in Uganda in relation to soil-root conditions.** *E. Afr. agric. J.* 21 (1), 1955 (34–41). 10 refs.

Contains tables of nutrient analyses of soils from various distances radially to 80 ft., and various depths to 7 ft., round 5 Mvule trees, and 2 sectional diagrams showing root distribution in size and number to 10 ft. depth and 15 ft. radius. As large trees are approached, bases and alkalinity increase. In deep soil, depth was exploited by roots spreading down with no tap root. In shallow soil, long laterals developed. The conditions for seedling, coppice, and sucker regeneration are discussed. Mvule should be grown on deep fertile soil with pH > 5·0 and cultivated when young.

221. BOLLE-JONES, E. W. **Comparative effects of ammonium and nitrate ions on the growth and composition of *Hevea brasiliensis*.** *Physiol. Plant., Copenhagen* 8 (3), 1955 (606–29). 32 refs. [E.e.]

The ability of *H. brasiliensis* to withstand extremely low pH values and relatively high NH_4 concentrations, and the requirement for a very small supply of Ca, may be a partial explanation of the successful cultivation of the crop under tropical, strongly acid, soil conditions.

222. MERGEN, F., and MALCOLM, R. M. **Effect of Hemlock [*Tsuga canadensis*] and Red Pine [*Pinus resinosa*] on physical and chemical properties of two soil types.** *Ecology* 36 (3), 1955 (468–73). 18 refs.

The influence of Hemlock and Red Pine on bulk density, field capacity, air capacity, infiltration rate, pH, and exchangeable Ca content of the soil was studied on Branford sandy loam and on fertilized Cheshire loamy sand. On the former, the results showed that the only effect was a slight lowering of the pH under Hemlock as compared with that under Red Pine. On the latter, where the level of exchangeable Ca was several times higher, the pore volume, infiltration rate, and Ca content of the surface soil under Hemlock were more favourable than under Red Pine. It seems that the content of exchangeable Ca in the surface soil is the most important single factor tending to bring about a

favourable physical condition of the soil. On the two sites investigated, no evidence was found to show that Red Pine is preferable to Hemlock for the maintenance of soil fertility. *From authors' summary.*

223. BOND, G., and MACCONNELL, J. T. **Nitrogen fixation in detached non-legume root nodules.** *Nature, Lond.* 176 (4482), 1955 (606). 6 refs. [Dept. of Botany, University of Glasgow.]

In further studies of detached *Myrica gale* and *Alnus* root nodules, the effect of O supply on N fixation and also some features of respiration were examined. The results showed that fixation and respiration were both markedly, and perhaps similarly, affected by reduction of O supply. The possibility which thus arises that the two processes are closely linked, will be further investigated. [Cf. *For. Abstr.* 16 (Nos. 2762–4).]

224. ENESCU, V., and PARASCAN, D. Observaţii asupra repartizării nodozităţilor in sistemul radicelar al aninului negru. **[The distribution of [bacterial] nodules in the root system of *Alnus glutinosa*.]** *Rev. Pădurilor* 70 (5), 1955 (234–5). [Rum.]

Investigations showed that in waterlogged soils the nodules were grouped on and round the tap root, but that in trees growing on canal banks with running water, they were distributed over the lateral roots, though never occurring on roots growing actually in the water.

225. **Fungi in forests.** *Nature, Lond.* 176 (4484), 1955 (671–2).

Summarizes a discussion at a joint session of the Botany and Forestry sections of the British Association (5 Sept. 1955). Four papers were read: (1) on ways of studying mycorrhiza formers in the soil (*I. Levisohn*); (2) on hypogeous fungi (*L. E. Hawker*); (3) some woodland species of *Endogone* (*R. M. Godfrey*); (4) fungal population of bark of living trees (*C. G. C. Chesters*).

226. LEVISOHN, I. **Isolation of ectotrophic mycorrhizal mycelia from rhizomorphs present in soil.** *Nature, Lond.* 176 (4480), 1955 (519). 1 ref.

During researches at Bedford College on soil fungi, mycelia known to form ectotrophic mycorrhizal associations were isolated from soil rhizomorphs, using the following method. Fresh rhizomorphs picked out of the soil were washed for ca. 10 sec. in 0·1% HCl, then rinsed in sterilized water and plated on nutrient media commonly used for culturing mycorrhizal fungi. In this way *Boletus bovinus, B. scaber,* and *Mycelium radicis nigrostrigosum* were isolated from soil brought in from the field and from experimental soil cultures grown in the laboratory. The isolation of ectotrophic mycorrhizal mycelia from soil rhizomorphs by this means has proved a convenient method of obtaining pure cultures of these fungi which, so far, have resisted isolation from individual hyphae.

227. MIKOLA, P. **An experiment on the invasion of mycorrhizal fungi into prairie soil.** *Karstenia, Helsinki* No. 2, 1953 (33–4). 5 refs. [E.] [Forest Research Institute, Helsinki.] O.B.D.

In an experiment in 1950–51, soil samples were taken on Plainfield Prairie, Waushara County, Wis., at varying distances from the outermost tree row of two shelterbelts, one of *Pinus resinosa*, the other of *P. sylvestris*, both 15 years old. The soil samples were sown with *P. strobus* and *P. banksiana* and examined after 4 and 5 months. Results are tabulated. Mycorrhizae developed a little sooner in *P. banksiana* seedlings, which grew faster than *P. strobus*. Mycorrhizae developed in soil taken at distances up to 6·5 m. from the row of *P. sylvestris*, but well-developed mycorrhizae occurred only in soils taken at a distance of 0·5 m. from the *P. resinosa*.

228. WENGER, K. F. **Light and mycorrhiza development.** *Ecology* 36 (3), 1955 (518–20). 5 refs. [Southeastern Forest Experiment Station, Franklin, Va.]

A study was made of the root systems of *Pinus taeda* seedlings growing (*a*) in full light with A horizon present, (*b*) in full light with A horizon removed, and (*c*) within the stand (31% light) with A horizon present. The numbers of seedlings investigated were 17, 10, and 29 respectively. The number of mycorrhizal tips per cm. root length under the three environmental conditions were 3·6 for (*a*), 2·6 for (*b*) and 1·1 for (*c*). It is evident from this result and from the general development of mycorrhiza (illustrated by photographs) that there is a strong relation between the light intensity enjoyed by the seedlings and the amount of mycorrhizal development. This is held to support Björkman's theory of the relation between surplus carbohydrates in the host plant and mycorrhiza formation [cf. *For. Abstr.* 5 (p. 160)]. The more extensive development of mycorrhizae associated with the presence of the A horizon is probably due to more numerous sources of infection in it.

229. LINNEMANN, G. Untersuchungen über die Mycorrhiza von *Pseudotsuga taxifolia* Britt. **[Studies on mycorrhizae of *P. taxifolia*.]** *Zentralblatt für Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, Jena* (*Abteilung 2*) 108 (13/16), 1955 (398–410). 15 refs. [G.g.] [Universität Göttingen.] O.R.S.

The trees examined ranged in age from 1 to 22 years and were from 7 different sites in N.W. Germany. Greenhouse experiments were also made. The first mycorrhizae formed in the first or second growing season. An examination of the older plants showed that ectotrophic myccorhizae predominated; there was only one, rather doubtful, instance of endotrophic mycorrhizae. Characteristic types were close feather-like groups, or fine, long, more abundantly and irregularly branched systems [illustrated in photographs and drawings]. Trees of the same age on the same site showed a great variety in root- and mycorrhiza-formation. The 22-year-old trees showed some mycorrhizae to a depth of 75 cm., the maximum depth reached by the roots on the site, an unfavourable gley soil.

230. MCMINN, R. G. **The root system of second-growth Douglas Fir.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 11 (3), 1955 (3).

A project to investigate the rooting characteristics of Douglas Fir was begun in 1953, when equipment for hydraulic excavation was tested and techniques for excavation and sampling developed. In the past two seasons 31 trees have been excavated in the Cowichan Lake area of Vancouver Island, representing dominant, sub-dominant and suppressed individuals of 4 age classes on two of the better Douglas Fir sites. Preliminary results showed that dominants possessed a greater volume of roots than suppressed trees of similar age, and that there was an increase in root volume with age for trees of the same crown class. Douglas Fir appeared to be essentially a tap-rooted species, characteristically with several main laterals running diagonally down into the soil. Although absorbing rootlets were more concentrated in the vicinity of the stem, they were also associated with horizontal lateral roots at considerable distances beyond the crown canopy. Mycorrhizae were most abundant in the surface 25 cm. of soil, and normally absent from the lower horizons (70–130 cm.), though numerous dark, threadlike rootlets were commonly present in the moist zone directly above the hardpan.

231. LJUBIČ, F. P. Vzaimodeĭstvie kornevyh sistem raznyh vidov derevjev pri sovmestnom proizrastanii. **[The interaction of root systems of different tree species growing in mixture.]** *Agrobiologija* 1955 (1), (112–6). [Russ.] I.M.I.

[Cf. *For. Abstr.* 16 (No. 2951); 17 (No. 369).] The present paper describes the results of root excavations in 1952–53 of seedlings in nest sowings of two-species mixtures made in 1949–50. In many of these, one species had sound roots and normal shoot development, while the other showed root damage and was stunted or moribund. The root damage occurred when the roots of two species were in direct contact, in the form of wounds [not described in detail] that extended in some cases to the central cylinder and led to the destruction of all the tissues, or strangulation. Root-grafts occurred between individuals of the same, but not between different species. In the following list, the partner suffering root damage is placed second: *Acer negundo*/*Catalpa bignonioides*, *Quercus robur*/'Green Ash' [*Fraxinus pennsylvanica*?]; *Ulmus parvifolia*/*Q. robur*; *Sophora japonica*/'Green Ash'. A table classifies the mixtures tried, as antagonistic [without indicating which partner suffered], favourable, or without observable effect. Antagonistic mixtures, in addition to those quoted above were *A. negundo*/*S. japonica* and *U. parvifolia*/'Green Ash'; and favourable ones were *Q. robur*/*A. negundo* and *C. bignonioides*/'Green Ash'. In a preliminary test for the possible effects of root secretions, fresh roots of *A. negundo* and *C. bignonioides* were extracted in distilled water for 24 hours and the extracts used in watering young seedlings of the two species in sand culture. *A. negundo* extract depressed growth and caused yellowing in *C. bignonioides* but not in seedlings of the same species. *C. bignonioides* extract showed no effect.

232. KARPOV, V. G. O konkurrencii meždu drevostoem i podrostom v nasaždenijah zasušlivoĭ stepi. **[Competition between tree stand and regeneration in plantations on the droughty steppe.]** *Bot. Ž.* 40 (3), 1955 (376–401). Many refs. [Russ.] [Institut Lesa Akademii Nauk SSSR, Moscow.]

A fairly detailed report is made on some of the author's experiments since 1952 in plantations on southern chernozem in the S. of the Balashov district, subject to severe droughts. Sowings of Oak (*Quercus robur*) and plantings of young seedlings of *Fraxinus pennsylvanica* and *Acer tataricum* were made under (1) 25-year Oak and (2) 43-year *Fraxinus excelsior*. The plots were sited so that illumination and root competition (when not eliminated) should be as uniform as possible. Treatments were: (*a*) isolation by trenching to 1-m. depth, with a tarred-paper barrier to prevent lateral movement of moisture; (*b*) partial reduction of root competition by digging to 20–25 cm. depth and picking out roots from the dug soil; (*c*) controls (all under canopy). Measurements were made of the daily course of light intensity and physiologically useful radiation, air temperature and humidity at 20 cm. and soil temperature at levels down to 20 cm. on 37 days in June–Aug., and soil moisture (to 2·5 m. depth) periodically from May to Sept. During the 3 years of the experiments, the young plants were counted at the beginning and end of the growing season, and measurements made of height, diam. at collar, number and dimensions of leaves and shoot extensions during the year. For 2 years observations were also made on phenological phases. Additional observations included the lifting of sample seedlings for determination of root weight, and some physiological measurements (transpiration, moisture variations in leaves, and leaf carbohydrate content at the beginning and end of the growing season). Results are summarized and discussed under the heads: effect of tree stand on environmental factors; competition for moisture (moisture supplies and their seasonal variations); root competition between tree stand and regeneration (as affecting development of the latter); effect of the light régime; root competition and some features in development of the young plants (with special reference to periodic dying back and coppicing and to effects of competition on the phenological cycle of growth phases). It is concluded that: (i) In the conditions studied, root competition for moisture, by the tree stand, is the chief reason for suppression and mortality of regeneration. When this factor was excluded, young plants of all 3 species developed a comparatively strong shoot system in only 5–6% of full light. (ii) No material difference in intensity of competition was found between young growth of one species under a stand of the same species and young growth under another species. In both cases the tree stand suppressed young growth by reducing soil moisture to values near the wilting coefficient. (iii) Of the 3 species used, Oak seedlings appeared to be best adapted to competition for moisture and light; their capacity for producing strong root and shoot systems in the first year (partly due to the considerable food reserves of the acorn) and for repeated regeneration of a shoot system by coppicing from the numerous dormant buds at the stem base, are advantageous and may be regarded as adaptations

to the severe conditions of Oak woods. *A. tataricum* was less affected than *F. pennsylvanica* by root competition. (iv) Root competition brought about marked changes in morphological features and phenological behaviour of the young plants, e.g. the spring growth phases occurred later in Oak seedlings, their production of lammas growth was inhibited (whereas in (*a*) 54–55% produced a second shoot extension in July, and 7–19% a third in Aug.), and shoot 'ripening' and terminal-bud formation were often poor (though good in (*a*)). Acting through effects such as these, root competition rather than light deficiency is regarded as responsible for suppression of regeneration to the state of '*torčki*', i.e. miniature stools formed by repeated dieback and coppicing. (v) Individual variation among seedlings was much reduced by moisture deficiency due to competition. (vi) Treatment (*b*) had little effect in relieving such competition. The views of Lysenko and others on the non-existence of intraspecific competition are repudiated. [Cf. *For. Abstr.* 17 (No. 369).]

233. VASILEVSKAJA, V. K., and KONDRATJEVA, E. A. Obrazovanie poček na kornjah drevesno-kustarnikovyh rastenii. [**The formation of buds on the roots of trees and shrubs.**] *Dokl. Akad. Nauk SSSR* 101 (5), 1955 (951–4). 10 refs. [Russ.] A.P.B.

Describes briefly the results of anatomical studies on 34 spp. reputed to sucker. Adventitious buds were found on roots of all but 8 of these, and were always associated with places where lateral roots had died back. Buds originated variously in various spp., from cambium + phloem parenchyma, from the latter alone, or from the phellogen. In the dioecious spp. *Populus pruinosa* and *Diospyros virginiana*, roots of ♂s formed more buds than those of ♀s.

181.4. Reaction to Biotic Influences (Competition etc.) and Fire

See Nos. 231–2, 247, 291, 296, 365, 367–9, 434, 524.

181.5. Reproductive Behaviour

See also Nos. 124, 127, 141, 232–3, 289 *et seq.*

234. EAMES, A. J. **The seed and *Ginkgo*.** *J. Arnold Arbor.* 36 (2/3), 1955 (165–70). 24 refs.

In a study at Ithaca, N.Y., fertilization in *Ginkgo* varied considerably in ovules of the same tree, among different trees in the same season, and on the same tree in different seasons. It may occur in late Sept. in green ovules on the tree, and in Oct. in ripe ovules on the tree or on the ground. Dormancy may occur in the embryo where unfavourable conditions induce it. The phylogenetical implications of these facts are discussed.

235. NEKRASOVA, T. P. Estestvennoe vozobnovlenie eli na Koljskom Severe. [**Natural regeneration of Spruce in the Kola Peninsula.**] *Bot. Ž.* 40 (3), 1955 (419–26). 20 refs. [Russ.]

Describes observations in the S.W. of the peninsula in various forest types. Seedlings ⩽ 2 m. high averaged 700/ha., or from 500 to 900/ha. in individual types; this is calculated to represent 0·03–0·05%, by number, of the seed fall, which is scanty since Spruce is here near its northern limit. In a small-scale sowing trial, seed of 52% germinative capacity gave after 1 year plant %s of 43 when properly sown in a manured and tended nursery, but only 0·026 when sown direct without covering in forest soil with the moss cover removed. The nursery plants also showed much better development. The chief reason for the sparse natural regeneration seems to be that seed shed in March–April on the snow tends to lodge on moss or other ground cover when the snow melts, and if germination occurs, the radicle seldom reaches the soil. Seedlings are frequent along the edges of bogs, but most of them die later from nutrient deficiency and lack of root aeration. Where germination does occur in drier sites, mosses such as the Hypnaceae may protect seedlings from physical agencies, but also compete with them, and better regeneration occurs among bushy lichens if these are not too dense. Micro-relief is important, most seedlings occurring on level ground or in depressions (except in types with a ground flora of herbs, where rotting stumps and logs bear the most seedlings). Vegetative reproduction occurs very frequently, chiefly by natural layering; but rooting along the branches of fallen trees is widespread, and in some such cases the 'young' trees coned as early as 1 year after death of the parent stem. It is also common for seedlings procumbent in the moss cover to lose their terminal bud and to develop up to 5 stems from dormant buds, each stem producing adventitious roots.

236. VAARTAJA, O. **Factors causing mortality of tree seeds and succulent seedlings.** *Repr.* from *Acta for. Fenn.* No. 62, 1954. pp. 31. 47 refs. [E.e.fi.]

Seed of *Pinus sylvestris* was subjected to temperature variations simulating those on exposed forest sites. This seed lost some of its germinative capacity during five days' treatments. Succulent seedlings of *P. sylvestris* died when subjected to immersion in winter for 15 minutes at temperatures from 51·5° to 55° C. Hardening pre-treatments shifted the critical point 2 or 3° upwards. In artificial humus soil exposed to strong insolation for 15 minutes, temperatures that were critical to the seedlings varied from 54 to 65°. These were recorded by thin thermocouples in a thin surface layer of the soil. In natural conditions even somewhat lower temperatures may prove fatal. The exposure of succulent seedlings of *P. sylvestris* and *Picea abies* to insolation on different artificial soils showed that most damage occurred on humus, quartz sand, and humus-sand mixture; in fine sand moisture readily rising to the surface reduced the danger of heat injury. Seeds of *Pinus sylvestris*, *Picea abies*, *Betula verrucosa*, and *B. pubescens* tolerated exposure to drought very poorly if germination was advanced enough to show a radicle 5–10 mm. long. The Birches seemed to be less tolerant than the conifers. Fine sand was the most unfavourable and moss the most favourable substratum of those tested. When succulent seedlings were exposed to drought for 53 to 77 days in the laboratory, survival was much better in humus than

in fine silty sand. Another experiment performed under two different conditions in the field showed similar dependence on soils. High mortality occurred in the early stages, when *Picea abies* tolerated drought better than *Pinus sylvestris*; later the relative tolerance was complicated by the conditions imposed. Extreme transpiration conditions did not damage young seedlings of *Pinus sylvestris*, *Picea abies*, *B. verrucosa*, and *B. pubescens*, if the soil was moist; growth, however, was reduced. Tolerance to cold varied considerably, especially with the developmental stages. In general, all these experiments indicated the sensitiveness of the earliest stages of trees. Many of the problems are complex and need much additional research.

Sowing of *Pinus sylvestris* in furrows pressed firmly on denuded spots yielded high germination after rain, and survival was high despite prolonged severe drought and the dry appearance (*Cladonia* cover) of the sites. Frost-heaving and snail and insect injuries caused some mortality. Germination was low in the shallowest furrows, owing to higher temperatures. Sowing of several species on natural covers or on humus gave poor results. The most important damaging factors, birds and ants, operated before germination, which was largely delayed by dry weather. Some loss was attributed to drought or high temperature soon after germination. The complexity and variability of factors affecting forest regeneration and the importance of the earliest phase of this are emphasized. *From author's summary.*

237. WENGER, K. F. **Height growth of Loblolly Pine seedlings in relation to seedling characteristics.** *For. Sci.* 1 (2), 1955 (158–63). 3 refs.

In a statistically based search for the best criterion of the future growth of *P. taeda* regeneration under even-aged management, observations were made on 2- and 4-year seedlings, previously infested or not infested by *Rhyacionia frustrana*, on two types of soil, burned and not burned. The height growth in the succeeding year was highly correlated with: total height/mid-diameter; mid-diam./ground-level diam.; terminal-bud length; main-stem needle length; number of branches; total height; proportion of main stem carrying needles; and previous year's growth. The last is considered the most promising for field use because its correlation with growth is very high, the relation is linear and independent of seedling height; it is easily measured, and under normal conditions was not affected by gross soil differences, controlled burning, or seedling age.

238. JAEGER, P. Sur la graine, la germination et la plantule du Kololo (*Gilletiodendron glandulosum* (Port.) J. Leonard (Césalpiniacées).) [**The seed, germination, and seedling of *G. glandulosum*.**] *C.R. Acad. Sci., Paris* 240 (22), 1955 (2170–2). [F.f.] O.R.S.

Chemical and physical properties of the fruit are given briefly. The seed proved to germinate readily. The seedlings are described. Any tendency of the tree to disappear must be attributed to the effect of fire and of land-clearing by man, not to any senescence of the species.

181.6. Life Form, Habit. Post-Seedling Development and Form

See also Nos. 126, 198–9, 422, 800.

239. BRINKMAN, K. A. **Epicormic branching on Oaks in sprout stands.** *Tech. Pap. Cent. St. For. Exp. Sta.* No. 146, 1955. pp. 8. 4 refs.

A study in S.E. Iowa of over 600 trees of 25- and 50-year Oak (mainly *Quercus alba*) originating from coppice shoots, showed that the % of trees relatively free from epicormic branches was highest (1) in fairly heavily stocked stands, (2) for dominant trees, and (3) for single stems as opposed to multiple-stem clumps. Diameter growth rate and the number of branches showed no clear relationships.

181.7. Duration, Longevity, Stature; Records of Exceptional Age or Size. Effects of Age on Behaviour

See No. 198.

181.8. Phenology

See Nos. 133, 215, 232.

182. Synecology, Plant Sociology: General, Principles and Methods

240. TÜXEN, R., and MEISSNER, H. **Bibliographia phytosociologica Germania, Pars III.** *Mitt. florist.-soziol. Arbeitsgemeinsch.* (*n.s.*) No. 2, 1950 (183–202). [G.]

An unclassified title list (alphabetically by authors) of works published in 1940–1949, plus some references supplementing parts I and II (Hannover, 1935 and 1943).

241. TÜXEN, R., and MEISSNER, H. **Bibliographia phytosociologica Germania, Pars IV.** *Mitt. florist.-soziol. Arbeitsgemeinsch.* (*n.s.*) No. 4, 1953 (184–200). [G.]

Covers 1950–1952, with some supplementary references for previous years.

182.1. Palaeoecology. History of Vegetation

See also Nos. 135, 257.

242. MATTHEWS, J. R. **Origin and distribution of the British flora.** Hutchinson's University Library, London. 1955. pp. 176. 83 refs. Price 8*s.* 6*d.*

Includes a chapter on the rise and expansion of forest.

243. **Studies in vegetational history in honour of Knud Jessen, 29th November 1954.** *Danmarks Geologiske Undersøgelse* (*Ser. 2*), *København* No. 80, 1954. pp. 308 + 21 plates. Price *Kr.*16.

Contains the following papers, all but two of them in English with Danish or Norwegian summaries, and each with its own list of references: (1) New mounting media for pollen grains (*B. B. Christensen*), (2) The synchronization of central European pollen diagrams (*F. Firbas*, in German). (3) Recurrence surfaces (*H. Godwin*). (4) Some microfossils from Danish late-Tertiary lignites (*P. Ingwersen*). (5) Interglacial pollen spectra from Greenland (*M. S. Bryan*). (6) The late-glacial flora

of Ireland (*G. F. Mitchell*). (7) The late-glacial flora of Denmark and its relation to climate and soil (*J. Iversen*). (8) Pollen analytical investigation of a C^{14}-dated Alleröd section from Ruds Vedby (*H. Krog*). (9) A late-glacial pollen diagram from southern Michigan, U.S.A. (*S. T. Andersen*). (10) Late-glacial macroscopic plant remains from Böllingsö (*I. Brandt*). (11) A pollen-analytical dating by Maglemose finds from the bog Aamosen, Zealand (*S. Jørgensen*). (12) Two standard pollen diagrams from South Jutland (*A. Andersen*). (13) Studies on the sub-atlantic history of Bornholm's vegetation (*V. M. Mikkelsen*). It is demonstrated that *Fagus sylvatica* has grown on the island since the beginning of the sub-atlantic period, but that, whereas *Fagus* is dominant in the rest of Denmark, *Carpinus betulus* is the characteristic forest species in Bornholm. *Carpinus* is particularly vulnerable to damage from cattle browsing, and it is suggested that the heaths in central Bornholm are due to the expansion of animal husbandry in the Middle Ages. (14) On age and origin of the Beech forest (*Fagus silvatica* L.) at Lygrefjorden, near Bergen (*K. Fægri*). Pollen analyses show that the forest, on the west coast of Norway, was established after the area was settled, probably between 500 and 1000 A.D. Beech was probably introduced intentionally from Vestfold, the only part of Norway where indigenous Beech was plentiful. (15) Prehistoric food plants and weeds in Denmark: a survey of archaeobotanical research 1923–1954 (*H. Helbæk*). (16) Ethnobotanical studies on bark-bread and the use of Wych Elm (*R. Nordhagen*: in Danish with English summary). An historical study of the use of bark (chiefly that of *Ulmus glabra*, but also of *Pinus sylvestris*) to make meal in times of scarcity in Scandinavia.

244. DANSEREAU, P. **The postglacial Pine period.** *Repr.* from *Transactions of the Royal Society of Canada, Ottawa* (*Sect.* 5, *Ser.* 3) 47, 1953 (23–38). 24 refs.

Considers the present ecological status of the north-eastern Pines, *Pinus banksiana*, *P. resinosa*, and *P. strobus*, and (assuming their requirements unchanged) considers 4 hypothetical situations that would explain their present dominance. Three further possible cases are outlined in which changed requirements are assumed, viz. (1) greater shade tolerance, (2) greater drought tolerance, and (3) greater moisture tolerance.

245. BRAUN, E. L. **The phytogeography of unglaciated eastern United States and its interpretation.** *Bot. Rev.* 21 (6), 1955 (297–375). 218 refs.

Discussed under the main heads: floristics [floristic relationships]; contributing fields of botany; vegetation pattern and correlation with past events; an hypothesis of Pleistocene origin of existing distributions; how far-reaching were the effects of glaciation?

182.2. Succession, Alternation and Periodicity in Vegetation

See also Nos. 26, 168, 294, 395–6, 582.

246. CONSTANTINESCU, N., and CLONARU, A. **Un caz de înlocuire a gorunului prin molid. [A case of substitution of Spruce for Sessile Oak.]** *Bul. sti. Acad. Rep. rom.* (*Sect. Şti. biol.*) 6 (4), 1954 (1087–93). 6 refs. [Rum.russ.f.] O.R.S.

Describes a case of natural succession where the extreme climatic conditions (especially frequency and duration of frost) prevented the usual succession to a mixed forest containing Beech and Silver Fir.

247. MARTIN, J. L. **Observations on the origin and early development of a plant community following a forest fire.** *For. Chron.* 31 (2), 1955 (154–61). 8 refs.

All herbaceous and shrub species present on a burned-over area in S.W. Nova Scotia before the fire, appeared after it, either from underground parts or from dormant seed. *Pteridium aquilinum*, dominant in the first year, had its dominance contested by herbaceous and heath plants in the second year. Suckers of *Betula populifolia*, *Acer rubrum* and *Quercus borealis* grew rapidly during the first year, but were severely pruned by deer, *B. populifolia* reaching a height of 6–8 in. and the Oak and Maple ca. 36 in., in the second year. Seedlings of *B. populifolia* and *Populus grandidentata* appeared in the second year but were restricted to patches of bare mineral soil.

248. LARSEN, J. A. **A study of an invasion by Red Maple of an Oak wood in southern Wisconsin.** *Amer. Midl. Nat.* 49 (3), 1953 (908–14). 13 refs. B.A.P.

A study made in north-western Dane County, Wis., allied to other evidence, indicates that *Acer rubrum* is found in Oak forests of Southern Wisconsin which have attained a stage prerequisite for transition to Maple/Basswood (*Tilia americana*) climax forest. Conditions in the forest have only recently reached the stage where *A. rubrum* will be able to compete with other species. It seems likely that it will continue to spread gradually throughout the forest.

249. MOYLE, J. B., and NIELSEN, E. L. **Further observations on forest invasion and succession on basins of drained lakes in northern Minnesota.** *Amer. Midl. Nat.* 50 (2), 1953 (480–7). 6 refs. B.A.P.

The importance is shown of soil type and drainage in influencing plant invasion and succession. Observations are presented on 4 types of soil: (1) coarse inorganic (gravel, rubble and cobbles), (2) fine inorganic (silt, sand and fine gravel), (3) organic (muck and peat), and (4) raw glacial soils in special locations.

182.4. Layer Communities

See Nos. 27, 159, 225.

182.5. Synecological Measurements and Methods

250. LINDSEY, A. A. **Testing the line-strip method against full tallies in diverse forest types.** *Ecology* 36 (3), 1955 (485–95). 17 refs.

The line-strip sampling unit [cf. *For. Abstr.* 16 (No. 1544)] is a combination of line interception and quadrat methods in which only the line is surveyed. It is shown, statistically and by comparison with full

tallies, to be suitable for detailed studies in three diverse types of eastern coniferous forests (Spruce/Fir, Red Pine/White Pine, and Jack Pine) and in a Maple/Beech stand. This unit has several important advantages, in both field and office work, over the quadrat as usually applied. It is ideal for permanent marking of sampling units. Strip-quadrats (fractions of the strip) can be varied in length *a posteriori* to make frequency comparisons with publications based on sampling by quadrats of any size not exceeding the strip area. Although the nature of dispersal may be determined, the need for this is much reduced because of a statistical property of very long sample units. The final number of line-strips needed may be calculated after running the first 5 or 6 at a station. Often about 8, each 600 ft. long, covering about 15% of the station area, are required to obtain an acceptable % standard error of 20 or less for each significant species. To obtain % sampling errors of similar amounts for density, basal area, and cover, the strip width need not exceed 20 ft. for eastern coniferous stands, but should probably be 24 ft. wide for Maple/Beech. Basal area is much more accurately sampled in coniferous stands than in Maple/Beech. Although introduced for coniferous stands and mechanically easier to use there, the line-strip method appears to be well adapted to hardwood stands, also, since only in the Maple/Beech stand were cover errors the lowest ones. The method is rapid, considering the area sampled and the scope of data obtained, and is well suited for judging sampling adequacy by statistical procedures. *From author's summary.*

251. LAMPRECHT, H. Über Strukturuntersuchungen im Tropenwald. **[The study of structure in tropical forest.]** *Z. Weltforstwirt.* 17 (5), 1954 (162–8). 18 refs. [G.g.e.f.]

On the basis of his investigations in the virgin forest of Venezuela the author discusses the best methods for structural analyses of tropical forests as a means of site determination and of gaining information on the development, light requirements, etc. of species. For his own profiles he chose strips of 10 × 80 m. (or more) subdivided lengthwise, combining 2, or even 3 partial profiles with one horizontal sketch. For a numerical evaluation of stand structure in tropical forest, the tree-class system of Olberg [see *For. Abstr.* 16 (No. 1585)] proved the most suitable. The minimum representative size for a species count was found to be from 1 to 3 ha., depending on the minimum diameters chosen. These enumerations showed that, contrary to expectation, many tree species occurred not singly, but in small groups.

252. AYASSE, L., and MOLINIER, R. Carte des groupements végétaux des environs de La Motte-du-Caire (B.-A.) au 1/10,000e: utilisation de la photo aérienne. **[Map of vegetation types in the neighbourhood of La Motte-du-Caire (Basses Alpes) on a scale of 1 : 10,000: use of aerial photos.]** *Rev. for. franç.* 7 (9/10), 1955 (696–707). [F.]

An experiment in the use of aerial photos for vegetation mapping, leads to the conclusion that they are useful for areas of France where a 1 : 10,000 contoured map is not available, but do not permit of detailed work. The vegetation of the Durance basin is intermediate between those of the Mediterranean and Central-European regions.

182.8. Ecology of Artificial (Cultivated) Plant Communities etc.

See also No. 704.

253. OVINGTON, J. D. **The ecological conditions of different woodland types.** *Proc. Linn. Soc. Lond.* 165 (2), 1955 (103–5).

Ecological conditions in pure stands of exotics planted in uniform blocks, such as now exist in many parts of Great Britain, differ considerably from those found in natural woodlands of native species. Since there is some evidence that secondary site factors may be modified by the type of forest established, a programme of ecological research has been initiated by the Nature Conservancy. Some points relating to the influence of the stand on precipitation, ground flora and development of the soils are discussed. Detailed reports will be published later.

187. Vegetation Types

See also Nos. 15, 164, 196–7, 252, 704, 1077, 1111.

254. GRAHAM, S. A. **An ecological classification of vegetation types.** *Mich. For.* No. 11, 1955. pp. 2.

Gives a tabulated summary of the author's system of classification. [Cf. *For. Abstr.* 8 (No. 919).]

255. SCHWICKERATH, M. Hohes Venn, Zitterwald, Schneifel und Hunsrück, ein vegetations-, boden- und landschaftskundlicher Vergleich der vier westlichen Waldgebirge des Rheinlands und seines Westrandes (Vorläufige Mitteilung). **[Hohes Venn, Zitterwald, Schneifel and Hunsrück: a comparison from the points of view of vegetation, soils and 'landscapes', of the four western forested ranges of the Rhineland and its western margin. (Preliminary communication).]** *Mitt. florist.-soziol. Arbeitsgemeinsch. (n.s.)* No. 4, 1953 (77–87). [G.]

256. ZEIDLER, H. Waldgesellschaften des Frankenwaldes. **[Forest communities of the Frankenwald.]** *Mitt. florist.-soziol. Arbeitsgemeinsch. (n.s.)* No. 4, 1953 (88–109). 42 refs. [G.]

Deals with the *Querceto-Vaccinietum, Fraxino-Carpinion, Acereto-Tilietum, Abieto-Fagetum,* and *Abieto-Vaccinietum,* along with very brief notes on the soils of the *Fagion* associations and on other forest communities represented in the area.

257. BUCHWALD, K., and LOSERT, H. Pflanzensoziologische und pollenanalytische Untersuchungen am 'Blanken Flat' bei Vesbeck. **[Plant-sociological and pollen-analytical studies of the 'Blankes Flat' near Vesbeck [Kreis Neustadt am Rbg., Hanover].]** *Mitt. florist.-soziol. Arbeitsgemeinsch. (n.s.)* No. 4, 1953 (124–46 + 2 dgms. + 2 tbls.) 28 refs. [G.]

Separate studies by the two authors: (1) the present vegetation and natural landscapes of the area (Pedunculate Oak/Birch; Sessile Oak/Birch to mixed forest with Beech; and bottomland types);

and (2) pollen analyses suggesting *inter alia* that Beech has been less abundant than Oak throughout the post-glacial period.

258. MATUSZKIEWICZ, A. Stanowisko systematyczne i tendencje rozwojowe dąbrów białowieskich. **[The systematic position and evolutionary tendencies of the Oak stands of Białowieża.]** *Acta Soc. Bot. Polon.* 24 (2), 1955 (459–94). 20 refs. [Pol.f.] O.B.D.

259. MATUSZKIEWICZ, W., and POLAKOWSKA, M. Materiały do fitosocjologicznej systematyki borów mieszanych w Polsce. **[The plant-sociological classification of the acidophile mixed forests of Poland.]** *Acta Soc. Bot. Polon.* 24 (2), 1955 (421–58 + 2 tbls.). 40 refs. [Pol.g.] O.B.D.

260. FRIEDRICH, A. G. Vegetationsgürtel in Nordkatalonien (Nordostspanien). **[Vegetation zones in Northern Catalonia (N.E. Spain).]** *Z. Weltforstwirt.* 17 (3), 1954 (81–7). 13 refs. [G.e.f.]

A general description of climate, soils, and vegetation, summarized in a schema distinguishing principally between high-lying regions (1500–800 m.) with (hygro)-mesophytic vegetation, medium regions (800–300 m.) subdivided into mesophytic northern and meso-xerophytic southern slopes, and a meso-xerophytic coastal region, with notes on main tree species, their distribution, management and exploitation.

261. JOVANOVIĆ, B. Fitocenoza krivulja u Srbiji. **[The *Pinus mugo* association in Serbia.]** *Šumarstvo* 8 (6), 1955 (321–30). 12 refs. [Croat.e.g.]

Describes the association *Sorbeto-mughetum* in the Suva Planina Mt., displaying some arctic and alpine features.

262. GAJIĆ, M. R. O šumskim fitocenozama planine Kotlenika. **[Forest phytocoenoses of the Kotlenik Mts.]** *Šumarstvo* 8 (1/2), 1955 (21–32). 8 refs. [Croat.e.g.]

The phytocoenoses (attaining ca. 750 m. alt.) are: *Quercetum confertae-cerris serbicum* sub-associations *typicum* and *carpinetosum orientalis serbicum*, *Querceto-carpinetum typicum*, *Fagetum montanum serbicum* and *Quercetum montanum*.

263. **Plant ecology [of arid zones]: reviews of research.** *Arid Zone Programme, UNESCO, Paris* No. 6, 1955. pp. 377 + 10 photos. 3059 refs. [E.f.] or [F.e.] Price £2. 11*s*. [$8·0; *Fr.* 2500].

A series of reports by experts, reviewing research up to date. A separate bibliography is given for each region. Reviews are either in English with French summary, or in French with English summary. The following regions are covered: Afghanistan, India and Pakistan (*F. R. Bharucha*); Iran, Israel and Turkey (*H. Boyko*); Latin America (*A. L. Cabrera*); Australia (*J. G. Davies*); Iraq, Jordan, Lebanon, Saudi Arabia, Syria and Yemen (*P. Delbès*); Egypt, Eritrea, Libya and the Sudan (*M. Drar*); Angola, S.W. Africa, Bechuanaland and the Union of S. Africa (*R. A. Dyer*); N.W. Africa (*L. Emberger*); The U.S. and Canada (*W. G. McGinnies*); Tropical East Africa: Ethiopia, Somaliland, Kenya, Tanganyika (*R. E. Pichi-Sermolli*). There are an index of plants and a subject index. [Cf. *For. Abstr.* 15 (Nos. 36, 2183, 3207).]

264. **Symposium: 'Vegetation types of India': Jan. 2-3, 1955.** Indian Botanical Society, Baroda. 1955. pp. 17.

Gives abstracts of 28 papers, mostly dealing with the general vegetation of different areas, but including discussions on the ecology of Sal and Teak, and the ecological status of grasslands.

265. FERNS, G. W. Hutan pajau sekitar Kalimantan-tenggara. **[Tidal forest in S.E. Kalimantan [Borneo].]** *Rimba Indonesia* 4 (3/5), 1955 (90–8). [Jav.e.]

Lists the chief species and discusses their uses for tanstuffs, firewood, charcoal, building etc. Regeneration is usually good.

266. BOUGHEY, A. S. **The vegetation of the mountains of Biafra.** *Proc. Linn. Soc., Lond.* 165 (2), 1955 (144–50). 6 refs. O.B.D.

267. KEAY, R. W. J. **Montane vegetation and flora in the British Cameroons.** *Proc. Linn. Soc., Lond.* 165 (2), 1955 (140–3). 1 ref. O.B.D.

268. BÁGUENA CORELLA, L. La selva virgen de Guinea y sus variantes. (Resumen geobotánico.) **[Virgin forest of [Spanish] Guinea and its variants. (A geobotanical summary).]** Instituto de Estudos Africanos, Consejo Superior de Investigaciones Científicas, Madrid. 1954. pp. 48 + 14 photos. 18 refs. [Span.] L.S.

Observations made during a tour, including not only notes on the primary forest proper, with a list of species, but also comments on littoral vegetation, Mangrove forest, Palm groves, Bamboo forest and other types of vegetation.

269. DONAHUE, W. H. **Some plant communities in the anthracite region of northeastern Pennsylvania.** *Amer. Midl. Nat.* 51 (1), 1954 (203–31). 33 refs. B.A.P.

An ecological study of this region which, being transitional between the Hemlock/White Pine/northern hardwood forests and the more southern Oak/Chestnut forests, supports communities related to both.

270. CHRISTENSEN, E. M. **The lowland forests of northern Wisconsin.** *Abstr.* in *Bull. ecol. Soc. Amer.* 36 (2), 1955 (50–1). A.P.B.

A study of 130 lowland and mesic forest stands based on random pairs and quadrats.

271. HUECK, K. Pflanzengeographisch-forstwirtschaftliche Probleme aus dem nordwestlichen Argentinien. **[Plant-geographical and forest problems of N.W. Argentina.]** *Z. Weltforstwirt.* 17 (6), 1954 (219–25). 6 refs. [G.e.f.]

A description of the natural forest types and their changes through human interference. The author distinguishes: (1) dry, open chaco forests, e.g. the Algarroba (*Prosopis alba* and *P. nigra*), Quebracho (*Schinopsis quebracho-colorado* and *Aspidosperma quebracho-blanco*) and a slightly moister Tula-Mistol type (*Celtis pubescens* and *Zizyphus mistol*);

(2) transition types characterized by Timbo (*Enterolobium contortisiliquum*), Cebil (*Piptadenia* spp.) and Palo blanco (*Calycophyllum multiflorum*); leading to (3) subtropical rain-forests extending from the north, with a humid 'Lamel' (*Phoebe porphyria*) and a Myrtaceous type with various *Eugenia* spp.; (4) the forests of the mountain slopes above 1200 m., a Pino/Nogal (*Podocarpus parlatorei/Juglans australis*), Aliso (*Alnus jorullensis*) and a highest, bush (*Polylepis australis*) type, somewhat resembling plant associations in the northern hemisphere. Overcutting, chiefly for fuel in the chaco forests, and overgrazing have done considerable damage, particularly where there is danger from shifting sand dunes. Management, afforestation etc. hardly exist. [Cf. *For. Abstr.* 14 (No. 1085); 17 (No. 164).]

272. FANSHAWE, D. B. **Forest types of British Guiana.** *Carib. For.* 15 (3/4), 1954 (73–111).

Presents the results of studies of stand composition and constitution, climate, soils and ecology on sample plots typifying: (1) the *Alexa imperatricis* faciation and (2) the *Dicymbe altsonii* faciation of the *Eschweilera/Licania* association, (3) the *Goupia glabra* facies and (4) the *Manilkara bidentata* facies of the *Goupia/Swartzia/Aspidosperma* assemblage, (5) the *Manicaria saccifera* faciation of the *Symphonia/Tabebuia/Euterpe* association, (6) the *Iryanthera lancifolia* facies of the *Iryanthera/Tabebuia* assemblage, and (7) the *Dicymbe corymbosa* faciation of the *Eperua/Eperua* association. Notes are also included on the Myrtle associations of islands of the Cuyuni River.

2. SILVICULTURE

See also Nos. 206, 209, 1097, 1111.

273. PIŠKULA, F., *et al.* Mechanisace pěstebních prací v lesnictví. **[Mechanization in silvicultural work.]** *Lesn. Knihovna (malá Řada)* No. 56, 1954. pp. 198. 17 refs. [Cz.] Price *Kčs*.25·50.

Illustrated descriptions of Czechoslovakian and foreign machines and tools (including tractors) for: seed extraction; preparation of soil for ploughing; soil preparation in forest nurseries and shelterbelts; sowing, weeding, watering and other operations in nurseries, and artificial and natural regeneration.

274. DAWKINS, H. C. **INEAC in the *"Forêt dense"*: impressions of some high-forest research in the Congo.** *Emp. For. Rev.* 34 (1), 1955 (55–60 + 9 photos). 5 refs.

Discusses particularly the system of 'uniformisation par le haut' [cf. *For. Abstr.* 13 (No. 2002)], banana-taungya and the use of 'Anderson groups' [cf. *For. Abstr.* 15 (No. 1319)] in the forest.

275. Problèmes forestiers au Congo belge. **[Forest problems in the Belgian Congo.]** *Bull. agric. Congo belge* 46 (3), 1955 (597–602). 2 refs. [F.flem.]

A general note by the central government forest service on the principal formations, the problems and the techniques used. These latter include strip enrichment, enrichment of almost totally cleared coupes, banana *taungya*, and crown improvement fellings. The first is costly, except in young secondary forest, the rest promising but only recently introduced.

276. MARÉCHAL, P. Notes sur le traitement applicable aux peuplements forestiers du Lac Léopold II. **[Suitable treatment for the forest stands of Lake Leopold II.]** *Bull. agric. Congo belge* 46 (3), 1955 (603–8). [F.flem.]

Aerial photography has revealed the drainage pattern of the marsh forest and provided information for dry-land routes for exploiting both marsh and dry-land stands. The composition, topography and tentatively suggested silviculture for these stands are outlined.

277. SIAL, N. M. **A review of *Acacia catechu* and its products with particular reference to Pakistan.** *Pakistan J. For.* 5 (1), 1955 (23–32). 26 refs.

278. TACKLE, D. **Lodgepole Pine management in the Intermountain region—a problem analysis.** *Misc. Publ. Intermt. For. Range Exp. Sta.* No. 2, 1954. pp. 53. 73 refs.

Includes methods of felling, thinning etc., utilization, forest survey, mensuration, silvicultural requirements and artificial regeneration.

22. Silvicultural Systems. Constitution and Composition of Stands: Forms of Stand

221. High Forest Systems

See also Nos. 13, 62, 505.

279. SOEDIBJA, R. SOEKARPI. Persoalan silvikultur di Sampit. **[A silvicultural problem in Sampit.]** *Rimba Indonesia* 4 (3/5), 1955 (83–9). 9 refs. [Jav.e.]

Discusses the methods to be used for assuring a supply of 300–400 cu.m. of *Agathis borneensis* daily to the Bruynzeel and Dajak sawmill. The 3 site types supplying *A. borneensis* are the peat type (1·1 trees/ha.), the true *Agathis* type (156–168 trees/ha.) and the *Tristania* type (66 trees/ha.). On the peat type, natural regeneration by other valuable species, e.g. *Palaquium* or *Shorea* spp., should be encouraged. Greater supervision by the Forest Service is required on the other two types, to ensure that during selection felling, damage is not so heavy as to disturb the equilibrium of the natural forest, reducing or preventing natural regeneration of *A. borneensis*. Limited planting might be done on areas where regeneration is poor. *From author's summary.*

222. Coppice, Pollarding and Lopping Systems

See also Nos. 282–4, 297, 561.

280. PAVARI, A. Il problema dei boschi cedui in Italia. **[The problem of coppice in Italy.]** *Monti e Boschi* 6 (8), 1955 (339–50). [It.f.e.]

Discusses the problems presented by the prevalence of coppice forest in Italy (3⅛ million ha. compared with less than 2¼ million ha. of high forest) and the diminishing use of charcoal (production almost halved between 1949 and 1954).

281. KOTZÉ, J. J. **The growing of *Eucalyptus saligna* on short rotations.** *J. S. Afr. For. Ass.* No. 25, 1955 (21–3). 1 ref.

Gives data confirming the suggestion that mining requirements for poles of the 3-, 4- and 5-in. classes are satisfactorily met in 9 × 9 ft. spacings by a 5-year rotation. For large sizes and perfect poles, coppice should be reduced to one shoot per stool, but for the same rotation and spacing, a higher production of pulpwood or of less regular mining timber can be got by the retention of 2 shoots on as many stools as possible (not likely to exceed 50%). Pulpwood with a superior radial weight gradient may require 10–12 years. An instance is quoted of 2 rotations of 5 preceded by one of 5 or more years, without drop in yield.

226. Changes of Silvicultural System. Conversion (by System or Species)

See also No. 287.

282. MILITSIS, G. Hē anagōgē tōn premnophuōn dasōn eis spermophuē kai hē dasikē diacheirisis—porismata ereunōn. [**The conversion of coppice to high forest, and forest management—results of research.**] Forest Research Institute, Ministry of Agriculture, Athens. 1951. pp. 497. [Gk.g.]

The book is divided into two main parts, the subject of the title being dealt with in Part A (80 pp.), mainly in the form of discussions and a circular on conversion issued by the Ministry of Agriculture. Part B has sections devoted to (1) Mensuration problems (general); (2) Management problems (general); (3) Elements of valuation, with tables.

283. PARANT, E. Regards sur une forêt souffrante. [**Observations on a long-suffering forest.**] *Rev. for. franç.* 7 (8), 1955 (597–602 + 3 photos). [F.]

An account of a mismanaged attempt (begun in 1860) to convert an Oak wood from coppice-with-standards to high forest.

284. HECKLY, L.-C. Prix de revient d'un enrésinement dans une forêt particulière. [**Costs of converting coppice-with-standards to conifers in a private forest.**] *Rev. for. franç.* 7 (8), 1955 (603–6). [F.]

Gives costs of operations carried out from 1948 in a derelict area of coppice-with-standards (a few Oaks and Beech, with understorey of Hornbeam and useless shrubs). The coppice was cut back, leaving one shoot to each stool, and the whole area planted at 3–4 m. with conifers in the proportion of ⅔ Spruce and ⅓ Douglas Fir and *Abies grandis*. Four years later the plantations were cleaned and 100 g. of K slag applied to each plant. A similar application was made in the following year and the plantation was beaten up. It is reckoned that at the end of 8 years the total cost of the operations will be Fr.73/plant or Fr.53,000/ha. for planting at a rate of 730 conifers/ha.

285. COOK, D. B. **Conversion of weed hardwoods to conifers in the Northeast.** *J. For.* 53 (9), 1955 (650–4). 8 refs.

Grey Birch and Birch/Aspen/Maple, the result of 10 years' regression on abandoned farm land in New York State (rainfall 50 in.), is followed, on felling, by heavy coppice and 3-ft. fern growth. Failures in planting conifers on such sites are attributed to using slow-starting shade-tolerant species (White Pine and Spruces) and tending them too late and too little. The authors' methods, mistakes, and successes in planting (*a*) Red Pine [*P. resinosa*] and (*b*) European and Japanese Larches are detailed, with a statement of man-day costs. Success depends on thoroughness, and on the correct timing of operations in relation to the growing periods of both plants and weeds, in which free use is made of modern poisoning methods.

228. Constitution and Composition of Stands; Choice of Species and Form of Mixture; Tree Classes; Forms of Stand

See also Nos. 251, 292–3, 407.

286. TACKLE, D. **A preliminary stand classification for Lodgepole Pine in the Intermountain Region.** *J. For.* 53 (8), 1955 (566–9). 6 refs.

[Cf. *For. Abstr.* 11 (No. 975).] *Pinus contorta* ranges from 4500 to 10,500 ft. in this area, the middle zones carrying relatively pure stands, the higher having invasive storeys of *Picea engelmannii* and *Abies lasiocarpa*, and the lower, of *Pseudotsuga taxifolia*. Age, elevation, aspect, fire, felling, insects, disease, wind, snow and soil are discussed as causes of stand differences. Fire and felling are the most important factors affecting density. The stands are classified as pure or mixed (< 80% Lodgepole Pine); young < 40, immature 40–120, and mature 120–140 years. They are variously subdivided into even-, two-, three-, and uneven-aged, with indication of the cause (fire, felling, heavy felling or stand deterioration). The mixed stands are further subdivided according to high or low elevation. Descriptive notes for each class and a diagram of classification are added.

287. WEBER, W., and GOTHE, H. Naturwaldgesellschaften—ein forstlicher Briefwechsel. [**Natural forest associations.**] *Z. Weltforstwirt.* 17 (6), 1954 (215–9). 14 refs. [G.e.f.]

Theoretical observations on the knowledge to be got from a study of natural forests, particularly as regards mixtures, are followed by a discussion and description of forest conditions in S. Chile where large tracts of natural forest (chiefly broadleaved) are to be converted into commercial forests. Economic conditions favour the introduction of exotic conifers in mixtures; of these, green Douglas Fir has proved successful in experimental stands established at Traiguén 40 years ago.

23. Regeneration and Formation of Stands

231. Natural Regeneration

See also Nos. 200, 220, 235–6, 581–2.

288. AHOLA, V. K. Traktorin käyttö metsänhoidollisissa raivauksissa. [**The use of tractors in silvicultural work.**] *Metsät. Aikak.* 1955 (6/7), (193–5). [Fi.e.]

Crawler tractors gave better results than wheeled tractors with half tracks in scarifying in state forests

of Lapland. Different types of tractor [illustrated], some designed by the Forest Service, have been tried. The use of tractors for this purpose would need to be linked with their use for e.g. drainage and timber transport. Scarifying by tractor may prove very useful in the large-scale regeneration of over-mature forests needed in N. Finland. *From author's summary.*

289. ROWE, J. S. **Factors influencing White Spruce reproduction in Manitoba and Saskatchewan.** *Tech. Note For. Br. Can.* No. 3, 1955. pp. 27. 14 refs.

A study of White Spruce [*Picea glauca*] reproduction was made during the summers of 1949, 1950 and 1951 on cut-over and burned-over areas and in undisturbed forest stands. Seed is produced in abundance once every 3–4 years, but germination depends largely on adequate moistness of the ground surface during June and July. Survival of seedlings is threatened by competition from other plants for light and moisture, and also by the smothering effect of the annual accumulation of herb, shrub, and tree leaves, particularly under hardwood and mixed stands. The most favourable seedbed in undisturbed forest is decayed wood. In disturbed stands where the humus layer has been burned or scraped away, conditions are also suitable for the establishment of Spruce, since competition is temporarily eliminated and the mineral soil (usually moister than the humus layer) is exposed. Logging rarely counteracts the conditions of the forest floor unfavourable to the reproduction of Spruce; the humus is not much disturbed (particularly in winter logging) and trees that would ultimately produce a rotted-wood seedbed are removed. The reproduction of Poplar, Birch, and Black Spruce associated with White Spruce is briefly discussed. *From author's summary.*

290. FOSTER, C. H. **The use of silvicides to establish White Pine by natural reproduction.** *Proc. 8th Ntheast. Weed Control Conf.* 1954 (415–9). O.R.E.

A brief report on experiments at the Pack Forest, Warrensburg, N.Y., in suppressing hardwood competition by means of chemical sprays. The experiments cover only one typical case. Every site class, soil type and forest type presents a somewhat different sequence of treatments.

291. TARRANT, R. F., and WRIGHT, E. **Growth of Douglas-Fir seedlings after slash burning.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 115, 1955. pp. 3. 1 ref.

Height and root length of 419 one- and two-year seedlings from unburned, lightly burned and severely burned soils were measured. Results, which are not considered conclusive, indicate that seedling growth had not been inhibited by broadcast burning after clear felling.

292. BEZAČINSKÝ, H. Problém obnovy prestárlych bučín a jedl'obučín na Slovensku. **[The problem of regeneration of over-mature Beech and Silver Fir/Beech stands in Slovakia.]** *Les, Bratislava* 2 (7), 1955 (275–84). [Slovak.]

Failure of natural regeneration in many such stands in Slovakia is tentatively explained by inadequate fellings which do not create favourable conditions. Analysis of a naturally regenerated overmature Fir/Beech stand (51 trees of Fir, Beech, Spruce and Maple) shows the presence of 3 generations: 150–180 years, mostly Beech, dominant, characterized by large volume and rather poor quality; 80–100 years, mixed subdominant, good quality; and 20–30 years, mixed, scattered, suppressed growth. The method of felling best calculated to encourage regeneration is discussed. It would be dangerous to fell most of the oldest stems because the younger growth would be deprived of protection; it is important to reduce the numbers without excessive opening of the canopy. Hence the second generation should be preferably felled, providing good conditions for regeneration from the dominant, oldest-generation seed-trees.

293. BREGA, P. Contribuţii la studiul factorilor care influienţează regenerarea naturală in arboretele de fag şi fag in amestec. **[The factors influencing natural regeneration in pure and mixed Beech stands.]** *Rev. Pădurilor* 70 (4), 1955 (163–9). 7 refs. [Rum.]

Data derived from a survey of natural regeneration in pure Beech and Beech/Spruce/Fir/Hornbeam stands are tabulated and discussed. It is concluded that the most important factors are: stand composition, position on margin or in interior of stand, aspect, slope, soil (depth, parent material, vegetation, litter layer) and silvicultural characters of the species.

294. ISSINSKIĬ, P. A. Vozobnovlenie duba v lesah Černomorskogo poberežjja. **[Regeneration of Oak in the forests of the Black Sea coast.]** *Lesn. Hoz.* 5 (10), 1952 (54–6). [Russ.]

About half the total forest area of Krasnodar Province consists of the Oak forests of the Black Sea coast, represented mainly by stands of coppice origin approaching maturity, but also containing a considerable stock of overmature trees. In view of their protective role, cutting is limited to sanitation and tending fellings whereby neither regular natural regeneration nor their rehabilitation can be attained; it is only by principal fellings that conversion into seedling high forest can be achieved. The possibility of successful seedling regeneration is supported by data from the 1949–50 experiments on regeneration of Oak under canopy in the forests of the Sochi leskhoz, based on seedling counts on 815 quadrats (2 × 2 m.) laid out in 83 sample areas of 0·2 ha. each. Three species occur—*Quercus hartwissiana, Q. iberica*, and *Q. sessiliflora*—all very similar in biological characters. In this mild climate they bear abundant mast every 3–4 years, but a considerable % is damaged by insects or eaten by mice and badgers. Results of seedling counts are tabulated for 6 forest types which showed from 4800 to 29,600 seedlings of Oak out of a total for all species varying from 10,300 to 57,500 per ha. The results also indicate *Ulmus foliacea* and *Fraxinus excelsior* as characteristic components of the natural regeneration on calcareous, and *Carpinus* sp. of that on acid soils. They also showed that a large-scale change of species

was in progress, in some types, from Oak to Hornbeam, the rate of which was higher on the acid soils; this progress, however, appeared to be somewhat checked by the dryness of the southern slopes occupied by the Oak, the present distribution of the latter being due to the Hornbeam's having ousted it from the shadier slopes. Though shade-bearing at first, more or less full canopy representing the optimum up to 5 years of age, Oak seedlings must have overhead release after ca. 7 years.

295. MUTIBARIĆ, J. Prirodno podmlađivanje kanadske topole. [**Natural regeneration of × *Populus serotina***.] *Šumarstvo* 8 (5), 1955 (266–72). 2 refs. [Serb.e.f.]

A trial plot was established in 1953 on the site of a 25-year-old clear-felled stand of × *Populus serotina* in the Plavanjskí Rit forest (Vojvodina plain). After 2 growing seasons 2845 suckers of > 1 cm. d.b.h. were counted on the sites of 78 uprooted stumps and 389 coppice shoots on 39 stools. It appears that this hybrid regenerates successfully on non-flooded alluvial soils and that stools assure the optimum natural regeneration.

296. ROY, D. F. **Hardwood sprout measurements in northwestern California**. *For. Res. Note Calif. For. Range Exp. Sta.* No. 95, 1955. pp. 6.

Measurements were made on a number of hardwoods one, two or three years after the aerial parts had been destroyed by fire or logging. Height growth of sprouts varied with species, in the descending order *Acer macrophyllum*, *Arbutus menziesii*, *Quercus garryana*, *Lithocarpus densiflorus* and *Cornus nuttallii*. In 3 years, the average clump of *C. nuttallii* had 14 sprouts (the tallest 6 ft.), and was 5 ft. in diameter. For all species, parent trees of larger diameter produced more and taller sprouts and wider clumps.

232. Artificial Regeneration

297. LÜCKHOFF, H. A. **The establishment and regeneration of *Eucalyptus saligna* plantations in the coastal belt of Zululand**. *J. S. Afr. For. Ass.* No. 25, 1955 (1–20). 4 refs.

The first results are given of research initiated in 1951, and general recommendations made for this species, which covers a large part of the 200,000 acres of short-rotation *Eucalyptus* grown in the Union. With complete ploughing and harrowing, the growth in diameter and height was more than twice that where similar treatment was restricted to the 4½-ft. planting strip. Growth in the latter was significantly better than in cultivated 3-ft. spots, either in old or new-burned grass. Direct planting in old or new-burned grass gave very few survivals. Burning grass results in greater competition. One, or if necessary 2, weedings in the first summer are also likely significantly to improve growth at 20 months. Figures are given for growth of coppice at 20 months when 1, 2 and all stool shoots are left. Diameter decreases and volume increases significantly with number of shoots left, but height growth remains unaffected. The general indication for pulpwood plantings at 9 × 9 ft. is that 2, or possibly more, shoots per stool should be left. Leaving slash unburnt at replanting is likely greatly to improve growth, but superphosphate applications of 200 and 400 lb./acre had no effect at 20 months. Recommended planting practice is described.

298. SAMPAIO, A. NAVARRO. Instruções para o plantio do eucalipto. [**Instructions for planting Eucalypts.**] Serviço Florestal da Companhia Paulista de Estradas de Ferro, Piracicaba. 1952. pp. 26 + 2 plates. [Port.]

Practical instructions relating to choice of species, site of plantations, sowing, transplanting, spacing and tending.

232.1. Choice and Trial of Species, Races etc.

See also Nos. 205, 287, 387, 509, 717.

299. BUDOWSKI, G. Algunos pinos y otras coníferas de la América Central y sus posibilidades para Venezuela. [**Some Pines and other conifers of Central America, and their possibilities for Venezuela.**] *Bol. Ingen. for. Univ. Los Andes* 2 (8), 1955 (7–22). 7 refs. [Span.]

Notes are presented on the following species: *Pinus caribaea*, *P. oocarpa*, *P. ayacahuite*, *P. montezumae*, *P. pseudostrobus*, *P. rudis*, *Cupressus lusitanica*, *Abies guatemalensis*.

300. WOOD, R. F. **Studies of north-west American forests in relation to silviculture in Great Britain**. *Bull. For. Comm., Lond.* No. 25, 1955. pp. 42 + 35 photos. Price 6*s*.

During 1952 and 1953, the author visited the forests of British Columbia and the Pacific Northwest of the U.S.A. to carry out field studies. The purpose of this bulletin is to examine and discuss the growth of the principal tree species (*Picea sitchensis*, *Pseudotsuga taxifolia*, *Tsuga heterophylla*, *Thuja plicata*, *Pinus contorta*, *Abies amabilis* and *A. grandis*), as observed in N.W. America, with particular reference to its implications for forestry practice in the British Isles. It is divided into the following sections. N.W. American coastal and British Isles environments (climatic comparisons); distribution and limits of species; silvicultural notes on the principal species and associations; provenance questions.

301. WOOD, R. F. **The use in Great Britain of certain North West American species**. *Emp. For. Rev.* 34 (3), 1955 (247–51).

Gives some notes on *Pseudotsuga taxifolia*, *Picea sitchensis*, *Tsuga heterophylla* and *Pinus contorta* and their natural habitat, discusses current planting practice with these species in Great Britain, and suggests the best conditions in which each species will thrive.

232.11. Species Trials (by Localities), including Forest Gardens, Trials of Exotics etc.

302. ROSS, D. **The Crarae forest garden**. *Scot. For.* 9 (3), 1955 (97–100).

Briefly describes the 34 acres in the County of Argyll recently handed over to the Forestry Commission by Sir George Campbell of Succoth, who began planting in 1933. The object was to raise and test in plots, under forest conditions in the Argyll

climate, rare and untried species, to ascertain their silvicultural potentialities, and record the results. The species tried (21 *Abies*, 18 *Picea*, 21 *Pinus*, 8 *Cupressus*, 5 *Tsuga*, 2 *Cedrus*, 2 *Sequoia*, and some others) are listed with a brief indication of performance.

303. DALMANNSSON, Á. Fimmtíu ára trjágróður i Eyjafirði. **[Fifty years of tree growth in Eyjafjorður.]** *Ársr. Skogræktarf. Íslands* 1955 (11–8). [Ice.]

Includes data on height and diameter measurements of a number of plantation species, including *Pinus mugo*, *P. sylvestris* and *P. cembra*, *Picea abies* and *P. glauca*, Larch, Birch, Aspen and *Sorbus aucuparia*.

304. MOCANU, V. G. Exoticele din parcul Calea-Codrului Ocolul silvic experimental-didactic Sinaia. **[Trials of exotics in the Calea-Codru park in the Sinaia experimental teaching Circle.]** *Rev. Pădurilor* 70 (6), 1955 (297–8). [Rum.]

Notes on performance of *Pseudotsuga taxifolia*, *Picea orientalis*, *P. sitchensis*, *P. mariana*, *Pinus strobus*, *P. koraiensis*, *Fraxinus pennsylvanica* var. *lanceolata*, and *F. biltmoreana*.

305. SPÎRCHEZ, Z. Contribuții la răspindirea speciei *Pseudotsuga taxifolia* Britt. in Transilvania de nord. **[*P. taxifolia* in northern Transylvania.]** *Rev. Pădurilor* 70 (4), 1955 (154–9). 13 refs. [Rum.]

Reviews experimental plantations and trees occurring in parks etc., and draws conclusions on the climatic, topographic and soil conditions required.

306. SPÎRCHEZ, Z. Poate crește cedrul in R.P.R.? **[Can *Cedrus atlantica* grow in Rumania?]** *Rev. Pădurilor* 70 (1), 1955 (34–8). 7 refs. [Rum.]

Describes the silvicultural requirements of the species and gives an account of specimens existing in Rumania, including dimensions of cones and seeds.

307. FISHER, H. H. ***Pinus bungeana***. *Amer. Nurserym.* 102 (3), 1955 (20).

A short general account, with a note on trials in the U.S.A. Reports indicate that *P. bungeana* will tolerate a wide range of climate, but requires soils of moderate fertility and moisture.

308. GRABOVSKAJA, A. A. Berezy i barhat amurskiĭ v lesnyh kuljturah juga lesostepi. **[*Betula* species and *Phellodendron amurense* in forest plantations in the southern forest-steppe zone.]** *Lesn. Hoz.* 5 (10), 1952 (41–4). [Russ.]

Trials made in 1937–51 by the Forest-Steppe Research Station in the S.W. of Kursk Province showed that *B. verrucosa*, *B. pubescens*, *B. ermani*, *B. dahurica* and *B. schmidtii*, which well withstood the severe frosts of 1939–41 as also the exceptionally dry summers of 1938, 1946 and 1951, could be successfully grown in this region. Trials with *P. amurense* showed that it could be grown on grey forest clay-loams, both pure and in mixture with *Quercus robur*, *Fraxinus excelsior*, *F. pennsylvanica*, *Pinus sylvestris*, *P. nigra* var. *caramanica*, *Caragana arborescens* and *Amorpha fruticosa*. Oak grown with *P. amurense* develops a straight, clean stem, whereas whole rows of Ash have been suppressed and killed by it. This is attributed to its root system's occupying the same soil horizon as, and being about twice the radius of, those of the Ash. *Amorpha*, on the other hand, should be removed at 10–15 years, as its roots become interlaced with those of *P. amurense*, implying keen competition for moisture, especially in drought years, between the two species. When grown pure, *P. amurense* was pruned at 4–5 years and the trees produced a single stem; in mixture, it usually forms several stems. Its height increment is greater and diameter increment less, when grown pure than when grown in mixture; and the thickness of the cork layer is much the same, though the cork is less fissured and more elastic when developed in pure crops. *P. amurense* has proved superior to Oak, Ash and the Pines, in frost and drought resistance.

309. GANENKO, I. G. Dub mongolskiĭ. **[*Quercus mongolica*.]** *Lesn. Hoz.* 5 (11), 1952 (78–81). [Russ.]

The poor shape and growth of *Q. mongolica* in the Far East is attributed to the fact that when the more fertile valley soils were cleared for cultivation, it was left only on the poorer and more exposed sites. Stands which formerly grew on the plains of the Maritime Province contained trees up to dockyard specification, reaching 24 m. in height and with diameter > 1 m. In trials at the Khabarovsk Arboretum the mean height and d.b.h. of two 22-year plots were respectively 7·4 m. and 8·8 cm. and 8·23 m. and 11·6 cm. Besides comparing favourably in growth rate with *Q. robur* when planted in the European parts of the U.S.S.R., *Q. mongolica* is no less drought-resistant and starts to bear acorns much earlier (at 16–20 years). A table gives the height, d.b.h. and height and diam. m.a.i. for *Q. mongolica*, *Q. robur*, *Phellodendron amurense*, *Juglans mandshurica*, *Tilia amurensis*, *Fraxinus mandshurica*, *F. pennsylvanica*, *Betula schmidtii*, *B. platyphylla* and *B. mandshurica* at 16–22 years.

310. GEŌRGOPOULOS, A. Symbolē stēn kalliergeia tēs leukēs idiaitera stēn Hellada. **[Poplar cultivation with particular reference to Greece.]** *Dasos* 7 (23/24), 1953 (6–32). 17 refs. [Gk.f.]

Includes an account of the striking early development of imported clones (Italian and French) of hybrid Black Poplars in various Greek nurseries and sites; data on survival, height growth and insect susceptibility are tabulated. The Greek climate favours a long growing season. [Cf. *For. Abstr* 14 (No. 311).]

311. BEARD, J. S. **The introduction of trees from Mexico.** *Trees S. Afr.* 7 (1), 1955 (14, 16). 1 ref.

Parts of Mexico, e.g. the temperate regions of the east [cf. *For. Abstr.* 12 (No. 1004)], are more likely sources of exotics suitable to S. Africa than the N. temperate deciduous region hitherto largely drawn upon. The author, basing his selection on the article quoted, describes the early growth of some of his broadleaved introductions (Ash, Oak, Liquidambar, Lime).

312. DE, R. N. **Exotics of Assam.** *Indian For.* 81 (7), 1955 (406–7).

Short notes on the main tree species introduced and their performance.

313. THIRAWAT, S. **The Eucalypts for tropical climates: based on experiences gained from the FAO *Eucalyptus* study tour in Australia 1952.** Royal Forest Department, Bangkok. 1954. pp. 107. 275 refs. [E.]

Cf. *For. Abstr.* 16 (No. 3967).

314. ARDIKOESOEMA, R. I., and KAMIL, R. N. Kaju pajung, *Musanga cecropioides*, sebagai kaju asing di Indonesia. [***M. smithii* as an exotic tree in Indonesia.**] *Commun. For. Res. Inst., Bogor* No. 47, 1955. pp. [19]. 15 refs. [Jav.e.] (*Repr.* from *Rimba Indonesia* 4 (1/2), 1955 (10–28).)

Discusses briefly the properties and uses of the wood and gives particulars of successful trials in experimental gardens at Pasirawi, Bogor, Pasirhantap and Tjikampek. Slight attack by *Corticium salmonicolor* and some wind damage occurred, but there were no serious difficulties. Flowering and fruiting were abundant after 3 years; ♀ and ♂ trees occurred in roughly equal proportions. The seed germinated freely in 90% sunlight and gave a 50–85% seedling yield. Minimum spacing for young plants is 3 × 2 m. Natural regeneration took place freely at Pasirhantap and coppice shoots were plentiful. M.a.i. figures quoted in 1950 [see *For. Abstr.* 12 (No. 2836)] showed a range from 14 cu.m./ha. at Tjikampek to 55 cu.m. at Pasirhantap.

232.12. Races and Provenance Trials

See also No. 592.

315. FLÖHR, W.; DITTMAR, O. Die bisherigen Ergebnisse der Douglasien-Provenienzversuche in den Lehrrevieren der Forstwirtschaftlichen Fakultät Eberswalde. Teil I. Die Entwicklung des Douglasien-Provenienzversuches aus dem Jahre 1910 in Chorin, Abteilung 90e. Teil II. Die Entwicklung des Douglasienprovenienzversuchs aus dem Jahre 1930 in Freienwalde, Abteilung 171. **[Results to date in the Douglas-Fir provenance trials at Eberswalde: I—The 1910 planting at Chorin. II—The 1930 planting at Freienwalde.]** *Arch. Forstw.* 3 (5/6), 1954 (385–431). 31 refs. [G.g.]

Unravels the historical detail, site factors, increment and yield, reaction to needle-cast (*Rhabdocline pseudotsugae*) and frost in the plots at Chorin (19 provenances) and at Freienwalde (10). At Chorin the *glauca* and transitional forms are ruled out for the N.E. German diluvium on the grounds of poor yield and resistance. To prevent uncontrolled crossing with *viridis* forms they should be cut out. The Snoqualmie *viridis* forms (from N.W. Washington) are recommended as the best performers, but from trials elsewhere in Germany even better ones (from Washington, Oregon, British Columbia and even California) are probably available. At Freienwalde, differences in soil, frost-hollow and side-shelter and a lack of replication spoiled the trial. The only significantly superior performer there was the grey Salmon Arm (British Columbia) form but this is unfortunately the only one to show, since the 1947 surveys, 5–10% of the residual stand suffering from needle-cast. The growth of Douglas Fir races in other parts of Germany and the most likely localities in the natural range from which to get superior forms for German conditions are discussed, and the need for further and better planned trials is emphasized.

232.13. Trials of Hybrids and Other Products of Tree Breeding

See also section 165.

316. DUNCAN, D. P., KAUFERT, F. H., and FRENCH, D. W. **Selected Poplars for Minnesota plantings.** *Minn. For. Note* No. 43, 1955. pp. 2.

In an endeavour to find a canker-resistant, hardy, fast-growing, straight-grained Poplar for farm planting in Minnesota, trial plantings were made of some 120 clones (including 75 hybrids). Height and diameter after 6 years, degree of cankering, and rooting capacity, are tabulated for the 11 best clones.

232.2. Preparatory Work, Auxiliary Measures

See also Nos. 274–5, 285, 297, 366, 383, 390, 392, 441.

317. LAURÝN, M., and MACÁK, Z. Způsob redukce třtiny jako důležitý činitel při zalesňování kalamitních holin. **[Method of reed-grass control as an important factor in afforesting areas devastated by natural causes.]** *Lesn. Práce* 34 (6), 1955 (259–68). [Cz.]

The area of Křivoklátsko, devastated by snow breakage in 1939 and by other agencies in subsequent years, and overgrown with *Calamagrostis*, was afforested in 1941–43 (pits) and in 1951–53 (furrows). The former method involved manual soil preparation, while the sod was cut and turned mechanically in the latter. The advantage of mechanical soil preparation over manual is obvious; it is necessary to turn at least 60% of the sod to obtain good results. The reed-grass must be kept low (weeded, cut) during the first 2 years after planting. Quick-growing species (Alder, Larch, also Pine) which overgrow the reed-grass within 5 years, proved best; the E.-W. furrow direction gave greater height increment.

318. ZAKOPAL, V. Jedna z cest k zlepšení sadebního prostředí křivoklátských kalamitních holin. **[One of the methods for improving the planting area in the Křivoklátsko areas denuded by natural causes.]** *Lesn. Práce* 34 (6), 1955 (274–80). [Cz.]

The author believes that the turning over of the *Calamagrostis* sod in these areas deprives the soil of its richest, well-structured portion. Besides clean fallowing, the author particularly recommends a new method of destroying this grass, viz. by covering the soil with a thin layer of mown grass ('grass pancake'). It is important that this cover remains readily permeable to rain-water, while precluding the access of light. Under it, the temperature and moisture content of the soil were generally found to be higher and to show less fluctuation than without it. After 2 months, the microbial processes

in the top layer of soil were so stimulated that the weeds could be readily pulled out. Analysis showed that the C/N ratio and the number of bacteria under the 'pancake' were greater in the 0–5 cm. layer and smaller in the 5–20 cm. layer than in the corresponding layers without this cover. The % of mineralized N was higher under the cover. The chemical composition of the soil when prepared mechanically (70 × 70 cm. patches) was less favourable than that of soil not so prepared, whether with or without the 'grass pancake' cover. Planting experiments with Pine showed the superiority of the soil with grass cover to bare soil, so far as survival and growth rate are concerned.

232.3. Seed, Nursery Practice, Direct Sowing

232.31. Seed

232.311. Seed Production (Seed Years, Seed Crops; Seed Orchards and Methods of Inducing Seed Production)

319. HAGNER, S. Iakttagelser över granens kottproduktion i norrländska höjdlägen kottåret 1954. **[Cone production by Norway Spruce in the highlands of Norrland during the cone year 1954.]** *Norrlands SkogsvFörb. Tidskr.* 1955 (2), (181–206). 5 refs. [Sw.sw.] (*Medd. Skogsforsknlnst., Stockh., Ser. Uppsatser* No. 36.)

The 13 plots examined were 0·5–1·2 ha. in area and lay at an altitude of 400–600 m. Average age of trees ranged from 110 to 250 years. The trees were examined from the S. side only and a correction factor was used for cones not visible from the south. 1954 was a very good cone year, numbers ranging from 58 to 194 per tree. Graphs are given showing the decrease with increasing age for the range covered in numbers of cones per tree. This number varied very little with height above sea level, but seed-weight/hl. cones decreased with increasing altitude. The 1000-seed weight increased slowly to 300–350 m. and then decreased, and the germination % remained fairly steady until about the same altitude, and then fell rapidly. These results are similar to those for the seed year 1942. Yield of seed per tree ranged from 21 to 72 g. In a study on 4 plots in Västerbotten, trees were grouped, by a subjective classification, into 5 vigour classes, ranging from 1 (good leader growth, no lichen, vigorous, apparently young) to 5 (half dead or dry top, much lichen, yellowish crown, apparently dying). D.b.h. and, on one plot, height were measured. Most of the trees fell into groups 2–4. Graphs show a direct and close relationship between number of cones per tree and vigour class. D.b.h. and height were generally lower in the better vigour classes, presumably because the trees were younger or had only recently reached the dominant crown layer. Within vigour classes a close relationship existed between number of cones and d.b.h., and there were considerable differences between diameters of trees with the same number of cones but in different vigour classes. The average age of trees in one plot was considerably higher (190–275 years) than in the other 3 (110–175); for the younger material, an increase in diameter was related to an increase in cone numbers greater than for the older material. The value of these results in selecting trees for seed collection, and in particular the need for selecting trees of greater diameter and height in the poorer vigour classes for a corresponding cone yield, are discussed.

320. ARNBORG, T., and ÅKEBRAND, V. Skogsinventeringar. I, II. Sällskapets för praktisk skogsförädling redogörelse över ett inventeringsarbete samt förslag till kottplockningens-områden för tall och gran. **[Forest inventories. I, II. Report by the Sällskap för praktisk skogsförädling on an inventory and proposals for cone-collection districts for Pine and Spruce.]** *Skogen* 42 (12; 14/15), 1955 (220–4; 266–7, 270). [Sw.]

I. Data from a survey of Pine in 1952–54 in Gävleborg, Kopparberg and Jämtland counties, with maps showing plus, normal and minus stands (illustrated) and recommended seed-collecting areas, and a table of latitudes and heights above sea level for named Pine provenances. II. Illustrations of plus, normal and minus Spruce stands, a map showing plus and the better normal stands in the same districts as for Pine, and some data on the presence of rot-affected stands in these districts.

321. ANDERSSON, E. Pollenspridning och avståndsisolering av skogsfröplantager. **[Pollen dispersal and the isolation by distance of seed orchards.]** *Norrlands SkogsvFörb. Tidskr.* 1955 (1), (35–100). 36 refs. [Sw.e.] (*Medd. Skogsforsknlnst., Stockh., Ser. Uppsatser* No. 35.)

Measurements were made, during two flowering seasons, of dispersal of 'near pollen' grains along 10 observation lines, 3400 m. long or less, 6 for Scots Pine and 4 for Norway Spruce. Particulars are given of the pollen sources, their locality, the direction and topography of the line of observation, and flowering and weather conditions. Results, given in graphs and tables, with English legends, show a decrease in pollen abundance with increasing distance from the pollen source, usually with a rapid decrease for the first 400–600 m., followed by a levelling out to a rate continuing fairly constant to the end of the observation line. Among the chief factors affecting pollen dispersal are extent of stand, abundance of flowering, time of maximum flowering, air humidity and temperature, wind direction and force, upwinds, speed of pollen fall, and topographical conditions. These factors make any comparison between stands or species very difficult. Pollen frequencies and germination of trapped pollen were high at different distances up to 3400 m. when conditions of dispersal were good and ♂ flowering was good or copious. Some calculations are made on the risk of incrossing in clone plantations, and the possibilities are considered of reducing this risk by establishing Pine plantations in Spruce areas or vice versa, by increasing flowering of plantation trees, by planting protective hedges or by displacing by a day or two the date of the beginning of flowering. [Cf. *For. Abstr.* 6 (p. 218).] There is a 15-page English summary.

322. OGIEVSKIĬ, V. V. Organizacija lesosemennyh učastkov borah. **[Lay-out of Scots Pine seed orchards.]** *Lesn. Hoz.* 5 (10), 1952 (62–3). [Russ.]

Discusses the technical side of seed collecting and considers that, on a long view, it is unwise to rely solely on Pine stands of intermediate age class, but that seed orchards should be established, with low-crowned trees for easy collection. Cones of young Pine furnish good seed, although this does not retain its germination capacity so well as seed from older trees. A Pine plantation at 2 × 2 m. spacing can be converted into a seed orchard in two ways: (1) by removing alternate rows in two consecutive operations—the first when the trees are 2 m. and the second when 4–6 m. high—finally leaving rows at 8-m. intervals: further thinning may be done if necessary; or (2) by first removing every third row and alternate trees in each row, and later every second pair of rows, leaving the remaining trees standing in double rows with 10-m. interspaces. In both cases the wide intervals between the rows permit cone collectors to stand on the ground to pick cones with hooks etc.

323. LANGNER, W., and STERN, K. Versuchstechnische Probleme bei der Anlage von Klonplantagen. [**Problems of experimental technique in the lay-out of clone orchards.**] *Z. Forstgenet.* 4 (3), 1955 (81–8). 6 refs. [G.g.e.f.]

Describes and discusses some possible arrangements of seed orchards, which would be a combination of seed orchard and clonal test.

232.312. Seed Collection, Extraction and Grading (including Seed Weight)

See also No. 339.

324. NORDSTRÖM, L. Vår försörjning med tallfrö med särskild hänsyn tagen til Norrlands höjdlägen. [**Our supply of Pine seed with special reference to high ground in Norrland.**] *Norrlands SkogsvFörb. Tidskr.* 1955 (1), (101–60). 32 refs. [Sw.sw.]

In experiments in N. Sweden, at altitudes varying from 40 to 450 m., on picking cones in the autumn (August–October) and storing by different methods, or picking them in winter (March–May), considerably increased germination %s were obtained from autumn-picked cones in all years except 1950–51, when temperatures in July–August were unusually high and good germination %s were obtained from winter picking. Results suggest that picking should start in early September and continue until heavy frosts begin; temperatures below − 4° C. should probably mark the end of picking. The method of storage seemed to be of little importance as long as cones were kept at a suitable temperature, at least 10°, for some months after picking, and protected from frost. The most suitable method is probably storage in layers 10 cm. thick indoors, or, if the cones are taken to the south of the country, out of doors. The cones should be covered for 1–2 months to protect them from too rapid drying. Autumn collection is likely at least to double the germination % of N. Swedish Pine seed and is cheap considering its advantages. [Cf. *For. Abstr.* 14 (No. 3292).]

232.314. Seed Purchase, Trade and Transport

325. **1955 forest tree seed directory.** FAO, Rome. 1955. pp. 158. [E.F.Span.]

This issue of the directory includes, as a special appendix, a letter from the Director-General, Commonwealth Forestry and Timber Bureau, Canberra, with a list of Eucalypt species of which small quantities of seed can be supplied, classified by broad climatic zones.

232.315. Seed Storage and Treatment

See also Nos. 127, 324, 334, 356, 580, 585.

326. TEXEIRA, M. R. Essais sur la conservation de la châtaigne. [**Chestnut storage trials.**] [*Pap.*] *3e Sess. Comm. int. Chât.* No. *FAO/CH*/13-*A*, 1955. pp. 2. [F.]

Experiments made in Portugal showed that selected sound chestnuts, placed in wooden boxes, covered with a 20-cm. layer of fine sawdust and kept in a cool, well ventilated room, had suffered a loss of only 4% by number and 5% by weight when examined in the summer following harvesting.

327. SKRZYPCZAK, J. Spostrzeżenia nad przechowywaniem żołędzi metodą Łotockiego. [**Observations on the storage of acorns by Łotocki's method.**] *Łas Polski, Warszawa* 28 (10), 1954 (23). [Pol.] From *abstr.* in *Prehl. lesn. Lit.* 6 (3), 1955 (No. 889). [Cz.] P.R.

Good results were obtained by storing acorns in a trench 2 m. deep and 1·2 m. wide. Acorns are placed in an 8-cm. layer on the bottom, covered with wet sand [thickness not specified], and when the alternate acorn and sand layers reach 1·2 m., the remaining 0·8 m. is filled with sand and topped with 30 cm. of soil.

328. CHIRILEI, H. Accelerarea germinației semințelor cîtorva arbori forestieri prin tratament termic. [**Heat treatment to accelerate the germination of forest tree seed.**] *Bul. ști. Acad. Repub. rom.* (*Sect. Ști. biol*) 6 (4), 1954 (1037–45). 4 refs. [Rum.russ.f.] O.R.S.

Seed of *Fraxinus excelsior* soaked for 72 hours in water at 49° C. gave 68% germination in 18 days; *Tilia tomentosa* (72 hours at 50°) gave 86% in 17 days; *Acer campestre* (72 hours at 40°) gave 69% in 13 days, and *A. tataricum* 75% in 14 days; *Robinia pseudoacacia* (48 hours at 49°) gave 82% in 9 days.

329. FILHO, O. A. GURGEL. Processos para auxiliar a germinação das sementes de essências florestais. [**Procedures for assisting the germination of seed of forest species.**] *Dusenia, Curitiba* 5 (2), 1954 (95–103). 10 refs. [Port.e.] L.S.

Various methods of seed treatment were tested on *Acacia decurrens* var. *mollissima*, *Dimorphandra mollis*, *Pterodon pubescens* and *Delonyx regia*. Scarification proved the most successful treatment for all 4 species. *D. regia* responded well to soaking for 5 min. in a 2% thiourea solution, and both *D. regia* and *A. d.* var. *mollissima* to soaking for 24 hours in a 4% solution of KNO_3.

330. VAARTAJA, O. **Effect of cellulose pelleting on the germination of seed.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 11 (2), 1955 (2–3).

Tests were made on seed of *Pinus banksiana* pelleted with fungicide and a sticker (Me cellulose solution) in order to determine the effect of the cellulose on germination. The results indicated that very heavy cellulose coats on seed may reduce germination, but that this effect is mitigated by the addition of such a fungicide as Orthocide to the pelleting material. Liquid fungicide did not have this effect.

232.318. Seed Testing. Germination Tests. Seed Quality

331. VĂETUȘ, T. Germinator electric. **[An electrically heated germinator.]** *Rev. Pădurilor* 70 (6), 1955 (301–2). [Rum.]

Describes, with drawings and scale plan, an electrically heated germinator developed at the state forest research station, the Costea type I.C.E.S. Germinator. Its advantages include reduced cost, greater ease of handling, and maintenance of a constant temperature.

332. SIMAK, M. Samengrösse und Samengewicht als Qualitätsmerkmale einer Samenprobe (*Pinus silvestris* L.). **[Seed size and weight as criteria of the quality of a seed sample (*P. sylvestris*).]** *Medd. SkogsforsknInst., Stockh.* 45 (9), 1955. pp. 19. 25 refs. [G.sw.] Price *Kr.*1.

A positive relationship was found between (1) seed size (by screening) and seed weight (1000-seed weight); (2) seed size and embryo quality (determined by X-ray); (3) seed weight and embryo quality. The relationships were not, however, very close, particularly in mixed samples of seed from different trees, and neither seed size nor weight can be used satisfactorily in determining the quality of a parcel. No general relationship was found between seed size, seed weight and quality of the parent tree.

333. MAGINI, E. Sulle condizioni di germinazione del pino d'Aleppo e del pino domestico. **[The conditions for germination of seed of *Pinus halepensis* and *P. pinea*.]** *Ital. for. mont.* 10 (3), 1955 (106–24). 19 refs. [It.f.]

A detailed report (with research data) on investigations at the Forest Research Institute, Florence, since 1949. The following conclusions are reached for seed of Italian provenance:— Optimum temperature for germination of *P. halepensis* is probably ca. 18·5° C., and for *P. pinea* ca. 17·5°. Temperatures above 25–28° prevent germination in both species and induce a dormancy that lasts until favourable conditions are re-established. Temperatures between 10° and 15° retard germination of both Pines but do not affect total germination capacity. Temperatures below 10° greatly reduce or entirely prevent germination. The most favourable medium for germination of *P. halepensis* is a relatively coarse river sand with a moisture content of 15–20%. Good results have been obtained with *P. pinea* in a medium with m.c. 15–25% but slightly higher humidity (20 or 25%) is rather more favourable.

334. LAVENDER, D. P. **Ponderosa Pine seed germination after exposure to varying temperatures and humidities.** *Res. Note Ore. Bd. For.* No. 24, 1955. pp. 4.

A study was made of the effect of various temperatures and relative humidities, after removal from cold storage, on germinative capacity of Ponderosa Pine seed. It is concluded that conditions capable of significantly reducing germinative capacity do not occur during normal handling of seed.

335. MESTICHELLI, C. La germinabilità dei semi di *Morus alba* L. nei vari mesi dell'anno. **[The germinability of *M. alba* seed in different months of the year.]** *Ann. Sper. agr.* (*n.s.*) 9 (4), 1955 (865–9 + 2 gphs. + 2 tbls.). 8 refs. [It.] C.G.B.

Tests made monthly over two consecutive 'forestry' years (running from August to July) on germinative energy of *M. alba* seed, showed that the monthly variation differed from one year to another, maximum values occurring in Sept. 1951 (85%) and Aug. 1952 (64·5%) and minima in Jan. 1952 (71%) and Sept. 1952 (36%).

336. BØRSET, O. Ospefrøets spireevne. **[The germinative capacity of Aspen.]** *Medd. norske Skogforsøksv.* 13 (1) (No. 44), 1954 (1–44). 13 refs. [Nor.nor.e.]

Germination tests were made between 1942 and 1953 on a total of 51,900 seeds. Results for the different years are tabulated, and graphs are given showing the effect of storage time, temperature during storage, light conditions, and different mother trees, on germination. Results include the following: (1) Freshly harvested, fully ripe seed has a high germination, usually > 80 and often $> 90\%$. (2) Germination % decreases with length of storage but at room temperature remains reasonably high for some weeks; after 30 days' storage it ranged for the different years from 30 to 83% and after 60 days from 1 to 58%. (3) Germination % was good at all temperatures tested (12–22° C. constant temperatures) but germinative energy was very low for temperatures $< 20°$. Temperatures fluctuating between 20 and 30° gave rather better, and those fluctuating between 20 and 36° rather poorer, results than a constant temperature of 20°, but differences were slight. (4) Germination in light or in darkness appeared to have no effect on germinative capacity or energy. (5) There were great differences in germination % in seed from different mother trees.

232.32. Plant Rearing. Nursery Practice

See also No. 298.

337. OLTVÁNYI, J. Telepítsünk, tenyésszünk jegenyefenyöt. **[The raising of Silver Fir for plantations.]** *Erdö* 3 (8), 1954 (287–289). [Hu.]

Seeds of 40% germinative capacity are sown at the rate of 500 seeds/m. in 8-cm.-wide drills 15 cm. apart, covered with a 2–3 cm. layer of humus, and protected by a straw mulch against frost. Silver Fir 3 to 4 years old is much more suitable than Norway Spruce for underplanting deteriorated Beech stands or 40- to 60-year-old Oak forests, using 10,000

seedlings/ha., or in groups each 0·1–0·3 ha. in extent.

338. FANTA, J. Polské zkušenosti s pěstováním osiky ve školkách. **[Polish experience in rearing *Populus tremula* in nurseries.]** *Lesn. Práce* 34 (7), 1955 (311, 314–6). [Cz.]

Information compiled from recent Polish articles and booklets. Aspen seed is extracted in Poland when the capsules are still moist. The catkins are placed first in a 20-cm. layer in a cool dark cellar. As soon as the capsules begin to burst, they are plucked from the catkins and rubbed to separate the seed from the 'cotton'. After another rubbing, ca. 80% of seed is separated from the cotton, and is cleaned by screening. From 25 kg. of fresh catkins are obtained 10 kg. capsules, yielding 1·6 kg. seed. If not sown immediately after extraction, the seed is stored for 4 days in a layer 1–2 cm. thick in a room at ordinary temperature [ca. 16–18° C]. It is then put into bottles (half filled), loosely stoppered and stored in a cool cellar for 4–5 days, and, finally, sealed and stored in sand or water. The nursery for Aspen should be absolutely level; light, moist, sandy-loam humous soils are recommended. In the autumn the soil is ploughed to a depth of 20 cm., left during the winter, and harrowed after the thaw. About 1–2 weeks before sowing, 2–3 barrowloads of brushwood are burnt on the soil, which is then manured, as necessary, and again harrowed. The seed is sown by hand in small furrows ca. 3–5 cm. wide, and up to 25 cm. apart, running the short way of the bed, which is well watered before sowing. Some 20–30 g./are of dry, or 40–50 g./are of green seed are used, spaced 0·5–1 cm. apart in furrows. Beds are covered with straw and watered during the first 2–3 weeks. After 4 weeks the seedlings are thinned out by cutting. Direct sowing in plantations was also tried in Poland, but proved less economical than nursery transplants.

339. LEWIS, W. E. **Growing Mahogany**. *Nyasld. Fmr. For.* 1 (2), 1953 (26–32).

Notes on seed collection, nursery treatment and planting of *Khaya nyasica*, with a table of height and diameter growth in the first 30 years at Dedza, Nyasaland.

340. AVILA LAZO, G. Un ensayo de crianza en el vivero de *Eucalyptus globulus*—consideraciones previas. **[An experiment in raising *E. globulus* in the nursery—preliminary considerations.]** *Bolivia Maderera, La Paz* 2 (15), 1954 (15–20). [Span.]

Two common methods used in raising Eucalypts, viz. seedlings ca. 5 cm. high, (1) pricked out in clay pots, or (2) planted in open nursery beds at 18-cm. spacing, were used in experiments to study the relative height growth of seedlings 90 days after pricking out. Method (2) proved the better, provided that the soil is of medium texture (never light) and is dug to a depth of ≮ 20 cm., and proper attention is given to watering and weeding. The seedlings should be pricked out so as to be ready for final planting in the rainy season, the planting to take place, if possible, in overcast weather.

232.322. Preparation and Treatment of Soil, including Maintenance of Fertility

See also Nos. 33–5, 345, 349, 352, 920–5.

341. **Nutrition problems in forest nurseries**. *Rep. Rothamst. exp. Sta. 1954*, 1955 (47–50).

Experiments in which rates of application of P and K had been tested over several years were concluded in 1954. Plots that had received annual dressings of superphosphate showed remarkably constant responses to P from season to season and centre to centre, ranging from very acid to almost neutral soils. Averaging all nurseries and seasons, the response in mean height to 6 g. P/sq. yd. was very close to ½ in. Up to the highest rate tested (6 g. P/sq. yd. or ca. 7 cwt. superphosphate/acre) the responses showed no signs of falling off, and a new series of experiments has been laid down to test higher rates. Responses to K were smaller, and varied more between centres.

Experiments continued with formalin and chlorpicrin treatment of poor soils, using Sitka Spruce as test species [cf. *For. Abstr.* 15 (No. 3484)]. Applications were made in June, October/November, December, and February, at 3 centres. Both formalin and chlorpicrin increased height growth at all centres. With formalin there were considerable differences between dates of application, the June treatment being inferior to the others at all 3 centres. The response to chlorpicrin seems to depend far less on time of application. Chlorpicrin applied only a few weeks before sowing, caused a considerable reduction in stocking. It is suggested that the fallow period annually observed in one or more sections of the older Forestry Commission nurseries would be a suitable time for large-scale treatments with formalin or chlorpicrin. The search for safer and cheaper alternatives to formalin and chlorpicrin has continued. CPB 55 (chlorobromopropene) has given promising results, both injected and as a drench, in an experiment on 1-year Sitka Spruce seedlings at Ampthill. As the inhibition of nitrification may play some part in the benefit derived from such materials as formalin and chlorpicrin, a number of substances known to inhibit nitrification were tested in pot experiments. One of these, $K_2Cr_2O_7$, showed some promise in pot experiments in 1952 and 1953, and was therefore tested in the field; 10 g./sq. yd. of $K_2Cr_2O_7$ dissolved in water was applied by power spray to the surface of plots in December. In all cases (3 different nurseries) height and plant number of Sitka Spruce seedlings were increased by treatment.

342. **[Nursery soil treatment for Eucalypts in Fiji.]** *Rep. For. Dep. Fiji 1954*, 1955 (5).

Trials carried out at Lautoka nursery on Eucalypt seed germination and growth indicated that soil sterilized with formalin gave better germination and growth, and that the admixture of sawdust [species not given] from an old sawdust dump had a depressing effect on germination and subsequent seedling growth.

343. VAARTAJA, O. **Effects of soil amendment, fertilizer, and fungicide on growth of seedlings.** *Bi-m.*,

Progr. Rep. Div. For. Biol. Dep. Agric. Can. 11 (3), 1955 (2).

Further experiments in a N-deficient nursery soil showed significant improvements in growth and colour of Spruce [*Picea glauca*] and Pine [unspecified seedlings] for treatments (alone and combined) with peat, forest humus, Captan fungicide, and NH_4NO_3. A combination of peat, fungicide, and N produced an almost 4-fold increase in height of seedlings. [Cf. *For Abstr.* 16 (No. 1657).]

232.323. Sowing and Covering

344. Pospíšil, B. Zemědělský secí stroj v lesních školkách. [**Agricultural sowing machine in forest nurseries.**] *Lesn. Práce* 34 (5), 1955 (200–9). [Cz.]

Illustrated description of the design, operation and merits of the 'Pracner-Budoucnost' sowing machine, equipped with additional parts and adapters for nursery work.

345. Boldei, A. O nouă metodă de semănare in pepiniere. [**A new method of sowing in the nursery.**] *Rev. Pădurilor* 70 (4), 1955 (173–4). [Rum.]

The ground is ploughed and disked in the autumn, and furrows 25 cm. wide and 50 cm. apart are made with a straight-edged hoe. Seed is sown in the furrows and covered (by hand) with 1–3 cm. of soil taken from the centre of the strip between the furrows. The final effect is 'quilted', with closely placed ridge and furrow 18–25 cm. deep. In the spring the soil of the ridges is gradually raked off, until the bed is level. The advantages are snow storage and protection of the drills from wind.

346. Scorțea, G. Metode de semănare a dudului in pepiniera '1 Mai' Medgidia. [**Methods of sowing Mulberries in a nursery.**] *Rev. Pădurilor* 70 (2), 1955 (79–81). [Rum.]

Five methods were tested in a nursery at Medgidia in the Dobrudja: (1) unstratified seed sown in spring, (2) whole fruit sown in summer immediately after gathering, (3) unstratified seed sown in autumn, (4) stratified seed sown in spring, and (5) cleaned seed sown in summer immediately after gathering. Best results were obtained with method (5). Summer or autumn sowings are to be preferred to spring, both for their better production and for reduced cost of tending.

347. Derr, H. J. **Seedbed density affects Longleaf Pine survival and growth.** *Tree Plant Notes* No. 20, 1955 (28–9).

Seedlings of *Pinus palustris* at densities of 10, 20 and 30 per sq. ft. had survival %s of 77, 71, and 58 respectively after the first growing season. Root-collar diameters averaged 0·41, 0·33, and 0·28 in., and level of seedling vigour was 81, 45, and 28% respectively. It is clear that the current sowing density (producing 30 seedlings per sq. ft.) is too high.

232.324. Transplanting and Lining Out, including Grading of Seedlings

See also No. 340.

348. Mork, E. Om sambandet mellom omplantningsavstand, planteutvikling, kulturresultater og kulturutgifter for 2/2 gran. [**Relationship between transplant spacing and plant development, plantation results and costs, for 2 + 2 Spruce.**] *Medd. norske Skogforsøksv.* 13 (1) (No. 44), 1954 (45–88). 12 refs. [Nor.e.]

Two-year-old seedlings were planted out in 1937 in rows 10 cm. apart, with seedlings spaced at 10 cm. (group A, 100 seedlings/sq. m.), 5 cm. (group B, 200/sq. m.), or 2·5 cm. (group C, 400 sq. m.) or in rows alternately 5 and 8 cm. apart, with seedlings spaced at 3·1 cm. (group D, 500 /sq. m.). No significant difference in mean height of 2 + 2 plants was found between the groups. Sorting into height classes showed the following % of cull plants (those < 13 cm.): A 1·5%, B 6·5%, C 10% and D 6·0%. There were significant differences in dry weight of tops between plants in groups A (average 47·44 g./10 plants), B (34·49) and C (23·84), but not between C and D (23·28). Similar figures for dry weight of roots are: A 15·485 g./10 plants, B 11·683 g., C 7·519 g. and D 6·828 g. The root/top dry-weight ratio remains fairly constant in all 4 groups. The amount of soil removed from the nursery on the roots of the 2 + 2 plants was 6 litres/1000 plants for groups C and D, 14 litres for group B and 18 litres for group A. Production costs per 1000 seedlings using 1939 prices were Kr.52·08, 33·34, 23·50 and 21·83 for groups A–D respectively. A correlation was found between plant spacing in the nursery and mortality in the field, mortality after 14 growing seasons being ca. 19% for groups C and D, 12% for B and 8% for A. A calculation of costs of seedlings and of labour when enough seedlings are planted to ensure the survival of 3000/ha. after 14 years, shows that if seedling price is based on production cost, group D seedlings will be the cheapest to buy, but that if it is based on height (i.e. is the same for all groups), group A seedlings will be the cheapest. Figures for height growth in the field show a correlation with nursery spacing, heights after 14 growing seasons being 178, 161, 152 and 156 cm. respectively for groups A–D. It is concluded that in the climate of Trøndelag, nursery spacings of 10 × 2·5 cm. will give satisfactory results, confirming preliminary conclusions drawn from investigations in 1952. [See *For. Abstr.* 14 (No. 3307).]

232.325. Tending (in both Seedbeds and Transplant Beds)

See also Nos. 352, 525–7, 921, 925.

349. Holmes, G. D. **Recent developments in the control of weeds in forest nurseries.** *Proc. Brit. Weed Control Conf.* 1953 (282–9). 22 refs. O.R.E.

A brief account of recent developments in chemical weed control with a short summary of recent work carried out by the U.K. Forestry Commission. Reference is made to the use of soil treatments before sowing, using materials such as MeBr and allyl alcohol. Contact spraying of weeds with mineral oils before tree seed germination, has proved generally successful in practical use in the U.K. Contact spraying of weeds among conifer seedlings or transplants has given good, but variable results. The causes of varying crop sensibility are discussed and reference is made to recent tests of materials other than mineral oils. The possible

value of soil-sterilizing treatment of fallow land in nurseries is discussed with reference to trials at present under way in the U.K. *From author's summary.*

350. STĂNESCU, C. Experimentarea ierbicidului 2,4-D (diclorofenoxiacetatul de sodiu) in lucrârile silvice. **[Experiments with Na 2,4-D as a weed-killer in forest nurseries.]** *Rev. Pădurilor* 70 (2), 1955 (75–9). [Rum.]

Lists, from Rumanian data, both tree and weed species in order of susceptibility.

351. STĂNESCU, C. Incercări de combatere, pe cale chimica, a tortelului. **[Chemical control of dodder in nursery beds.]** *Rev. Pădurilor* 70 (3), 1955 (128–30). [Rum.]

All vegetation should be carefully cut on the infested areas and from a 0·5–1 m. surround, and taken away and burned. The soil is then treated with an 0·2% solution of 2,4-D.

232.327. Protection Measures in Nurseries

See also Nos. 343, 511–2.

352. MAŞCANU, A. Contribuţii la precizarea ecologiei gîrniţei şi a culturii sale in pepiniera. **[The ecology of *Quercus frainetto* and its cultivation in the nursery.]** *Rev. Pădurilor* 70 (2), 1955 (58–60). [Rum.]

Observations were made in a number of nurseries, to determine the causes of die-back of *Q. frainetto* seedlings. No pathogens were found. Preventive measures recommended are: abundant watering, care not to compact the soil in the rows, and covering with straw or heaped-up snow in winter.

353. COCKERILL, J. **Studies in the control of damping-off of Red Pine, Provincial Forest Nursery, Orono, Ontario.** *Project, Division of Forest Biology, Department of Agriculture, Canada* No. 51.01.08 (Interim Report), 1954. pp. 18.

The following treatments were applied to *Pinus resinosa* seedbeds (120 sq. ft. each) in October 1951: (1) a mulch of peat-moss at a rate of 4 bushels/seedbed; (2) $FeSO_4$ at 4·13 lb./seedbed (Rate *A*); (3) $FeSO_4$ at 8·26 lb./seedbed (Rate *B*); (4) ½ inch of vermiculite; (5) acid sand at 1 bushel/seedbed; (6) control. The following generalizations are based on statistical analysis of the experimental data: Germination in (1) was lower than in any other treatment. When allowance was made for the effect of density on seedling mortality, (1) remained significantly more effective than other treatments in controlling damping off, and this beneficial effect could not be accounted for solely on the basis of a reduction in the pH value of the soil. There was a relationship between sowing density and mortality: mortality increased at an increasing rate with increases in density. Difficulties of application and hazards of frost injury to seedlings, however, make the use of peat-moss impracticable at present.

354. SALISBURY, P. J. **A review of damping-off of Douglas Fir seedlings in British Columbia.** *Repr. from For. Chron.* 30 (4), 1954 (407–10). 16 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 157.)

Except in new nurseries, damping off in B.C. forest nurseries has remained below serious levels. Modification of nursery practices has served to reduce losses. The use of a suitable sandy cover soil has been effective. Lowered fertility of the soil, though a problem in itself, appears to decrease the incidence of damping off. Soil acidity in coast nurseries may have afforded some natural control. From investigations on the control of damping off, there appears to be promise in the use of peat as a planting medium for stratified seed, and, based on experiments with unstratified seed, in the application of fungicides to cover soil. In view of the present low level of the disease, there would appear to be an opportunity for research directed to the biology and control of fungi known to be capable of causing sudden outbreaks, without the urgent need of finding immediately effective control measures. *From author's summary.*

355. VAARTAJA, O. **Damping-off pathogens on *Caragana* [*arborescens*] [seedlings in Saskatchewan nurseries].** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 11 (3), 1955 (2).

356. CRAM, W. H. **Toxicity of eight fungicides to Caragana seed.** Forest Nursery Station, Indian Head, Sask. 1955. pp. 1.

Tests of 8 commercial fungicides that showed promise for control of damping-off fungi, were made (*a*) before and (*b*) after stratification of *Caragana arborescens*. Tersan, Ceresan, Arasan, Spergon and Manzate all reduced germination and development when applied as (*a*), while Captan had no apparent toxic effect. In (*b*) tests, Tersan and Captan gave only slight reduction in development while the others were more or less toxic.

357. BOUČEK, B. Krtonožka. **[[Control of] *Gryllotalpa gryllotalpa*.]** *Lesn. Práce* 34 (4), 1955 (184–5). [Cz.]

Illustrated description of a method of catching *G. gryllotalpa* (in nurseries) in jam jars or tins between which boards 8 cm. wide and 1 cm. thick are embedded 5 cm. deep in the soil.

232.328. Vegetative Propagation

See also No. 458.

358. LARSEN, C. M. **The seasonal variation in the natural rooting capacity of cuttings of Norway Spruce and Sitka Spruce.** *Z. Forstgenet.* 4 (3), 1955 (69–80). 16 refs. [E.e.g.f.]

A report on experiments made at the Royal Veterinary and Agricultural College's Arboretum, Hörsholm, Denmark. Young twigs of the current year's growth were collected from lateral branches of Norway and Sitka Spruce. Four series were collected, in each series only cuttings from a single tree being taken, to avoid any influence of clonal variations. The cuttings were taken in the period from the beginning of June to mid-April of the following year, were propagated in cold frames, and examined the following autumn. Seasonal variations were noted in rooting ability, in the number and length of roots, and in the formation of new shoots. After the first assessment nearly all living cuttings

were replanted and a second assessment was made in the following August, when a definite tendency to a levelling out of the seasonal variations was evident. Experiments to investigate the influence of environmental conditions on rooting response show that the seasonal variations are due largely to variations in the environmental growth conditions, but also to variations in length of cuttings. From the practical point of view the only difficult period for rooting is at flushing, but the best time for taking cuttings under Danish conditions is early spring or the months of June and July, so that rooting can take place before the winter.

359. MARION, J. Marcottes de chêne-liège. [**Layering of *Quercus suber***.] *Rev. for. franç.* 7 (8), 1955 (595–6 + 2 photos). [F.]

Describes layering that occurred naturally in Morocco in young trees bent and broken and partially covered with earth by a bulldozer.

360. MARIĆ, B., and PENO, D. Tehnika kalemljenja šumskog drveća. [**The technique of grafting forest trees.**] *Šumarstvo* 8 (5), 1955 (258–65). 7 refs. [Serb.e.f.]

Preliminary results are given of experiments in grafting *Pinus sylvestris* and *P. nigra*, and also of grafting *Castanea sativa* on *Quercus robur* and *Q. cerris*.

232.329. Miscellaneous (including Greenhouses, Frames, Raising in Pots, Tubes etc.)

See also Nos. 340, 391.

361. BUDKE, A. Parenisko—dobrý pomocník pri nakličovaní lipového semena. [**Hotbed—a help in the germination of Lime seed.**] *Les, Bratislava* 2 (3), 1955 (121–2). [Slovak.]

Describes a hotbed for the germination of *Tilia* seeds. On the bottom of a pit 65 cm. deep, there are laid: a 5-cm. layer of straw or dry leaves, then ca. 45 cm. of horse dung mixed with straw; after 3–5 days the manure is compressed to ca. 35 cm. and is then topped with 25 cm. of well composted soil. Hessian is laid on this and then a 5-cm. layer of stratified Lime seed (cleaned of sand) which is sprayed with water and covered with moist hessian. The whole is enclosed in a standard glass frame. Germination starts in 6–15 days.

362. JOHNSON, E. W. **A simple device for making paper pots.** *Tree Plant. Notes* No. 20, 1955 (11–3).

Describes (with illustrations) a simple hand-operated machine for making pots from common roofing paper, devised at the U.S. Southern Great Plains Field Station.

232.33. Formation of Stands by Direct Sowing

See also Nos. 231, 391, 441, 580, 585.

363. STOECKELER, J. H. **An improved cylindrical seed spot screen and setter.** *Tree Plant. Notes* No. 20, 1955 (7–8).

364. SANZ-PASTOR, J. M., and PIEROLA, F. DE. Repoblaciones por siembra. [**Afforestation by direct sowing.**] *Montes, Madrid* 11 (62), 1955 (135–7). [Span.]

The author maintains that it is not always necessary to plant if the first sowings fail. Causes of failure should first be analysed and corrected if possible. Some data on trial sowings and plantings of *Pinus cembroides* are presented, and examples are cited of sowing Cedar in the Lebanon, and Aleppo Pine in Spain.

365. SCHOLZ, H. F. **Growth of Northern Red Oak seedlings under variable conditions of ground cover competition.** *Tech. Note Lake St. For. Exp. Sta.* No. 430, 1955. pp. 2.

Only a small % of acorns developed into first-year seedlings, the lowest germination occurring on bluegrass sod and the highest on a woody-shrubs site. Initial establishment was 57% higher on screened spots than on unprotected scalps. The poorest survival after 5 years was on the third cover type, dense fern, where 77% of the small trees died.

366. KALMYKOV, S. S. Gnezdovye posevy greckogo oreha v Kazahstane. [**'Nest' sowing of *Juglans regia* in Kazakhstan.**] *Lesn. Hoz.* 5 (10), 1952 (38–41). [Russ.]

Seedlings having been found to suffer badly from transplanting, trials with direct sowing were initiated in 1949–51 in the mountains of Southern Kazakhstan, the mild climate of which is particularly suitable for Walnuts (winter temperatures seldom dropping below 17–18° C.). 'Nest' sowing gave better results than 'line' sowing. In both methods the sowing patches were arranged at 3-m. spacing in, and 5 m. between rows, but the 'nest' had seed-spots in quincunx and the 'line' method 3 seed-spots in line parallel to the long side of the patch. Patches made up as small separate terraces (1 × 1·5 m.) are preferred to patches made on the slopes without terracing. It was found, however, that the quincunx pattern of seed-spots in a 'nest' was unsuitable, since in preparing the terraces the most fertile topsoil was removed from the back, while the soil banked along the outer edge tended to dry out, thus creating less favourable growth conditions in seed-spots near the edges. Practice has therefore been changed to give only one seed-spot, sown with 10 seeds, at the centre of each nest. Use of wheat as a cover crop did not give good results as the Oak was left unprotected after the harvest and tended to become scorched; better results could probably be obtained with crops such as maize and sunflower, which are harvested later in the season; the stubble could be left to protect the Walnut in the winter and to assist in the accumulation of moisture. The existence of a direct relation was noted between the number of seeds per seed-spot and the height of the Walnut. This was sown pure, or with *Prunus divaricata* as an auxiliary species.

367. ADRIANOV, S. N. Vlijanie dopolniteljnogo uvlažnenija i količestva vshodov v gnezde na rost duba. [**The effect of supplementary moisture and of the number of seedlings per nest on the growth of Oak.**] *Lesn. Hoz.* 5 (11), 1952 (11–15). [Russ.]

In connexion with the planting of shelterbelts on irrigated land, the Kherson Agricultural Institute has made experiments on the optimum soil moisture content for raising Oak and auxiliary species. In

April 1951, 1-year Oak, Gleditsia and Apricot seedlings and 1-year *Populus nigra* var. *italica* cuttings were planted, and seed of Oak, *Sophora japonica* and *Fraxinus pennsylvanica* was sown in 6 plots in the Institute's nursery. The moisture content of the dark-chestnut soil had been brought to various %s of its dry weight and kept there by watering once a week between April and mid-September, as follows [moisture in % of field capacity in brackets]: Plot No. 1, 21–24 (57–65); No. 2, 18–21 (50–57); No. 3, 15–18 (40–50); No. 4, 12–15 (35–40); No. 5, 10–12 (27–35); control ca. 10 (27). Results at the end of the 1951 growing season indicated a soil moisture of 18–21% as the optimum for Oak; this species, which on the steppes usually transplants poorly, showed ca. 98–100% survival and vigorous growth in irrigated plantings. The optimum soil moisture for Gleditsia, *S. japonica*, and *P. nigra* var. *italica* was 18–21% and for *F. pennsylvanica* and Apricot, 18–24%. In 1951 the Institute carried out two additional trials to determine the effect on Oak development of various sowing densities both uniform and quincunx, in 'nests'. For this, 23 ha. of experimental shelterbelts were laid out on a southern chernozem. On 5 ha. 7400 nests, each 20 × 30 cm., were sown uniformly in April 1951 and divided into five series, having respectively 10, 20, 30, 40 and (control) 5 acorns per nest. The soil in and between the rows was cultivated four times during the first growing season. Healthy, vigorous Oak resulted and survived the winter. Detailed assessments at the end of the 1951 growing season showed that 11–15 acorns/nest gave the best results. On another 5·9 ha. sowings were in quincunx in nests 60 × 60 cm., strictly according to Lysenko's instructions, with similar soil cultivation etc. Comparable success was recorded, Oak sown uniformly at 15 per nest showing similar development to Oak sown in quincunx at 20 per nest. The best Oaks (mean height 12·7 cm.) were in nests containing 16–20 seedlings, the poorest (11·5 cm.) in nests with 5 and fewer seedlings. Uniform sowings, however, proved to be far more labour-saving, in terms of hand cultivation.

368. KORJAKIN, D. A. Osobennosti rosta duba v kuljturah sozdannyh po sposobu V.D. Ogievskogo. **[Characteristics of the growth of Oak in plantations established by Ogievskiĭ's method.]** *Lesn. Hoz.* 5 (11), 1952 (16–9). [Russ.]

Gives some data for sowings and plantings, 15 to 53 years old, made by Ogievskiĭ's patch ('nest') method in the Tulskie Zaseki (northern forest-steppe) and the Central Chernozem Reserve, to illustrate their relative success in competition with grass growth. In this competition the marginal plants of a patch lag in height growth behind the centre plants, but serve to protect the latter. The height growth of the centre plants, however, begins to decline comparatively early, at 12–15 years in the forest-steppe and at 15–20 in the chernozem trials, i.e. before general closure of the canopy, under the rather wide patch spacings employed; hence it is very difficult to thin for the benefit of the centre plants without further delaying closure. The author therefore recommends that early general closure of canopy, at ca. 15 years, should be the first aim; this could be achieved by using 1200–1300 patches/ha. with a patch area of 1 sq. m. for the central forest-steppe/chernozem and 0·6 sq. m. for the northern forest-steppe zone.

369. ORLENKO, E. G. O vzaimootnošenijah duba v gustyh kuljturah. **[The [competitive] interrelations of Oak in dense plantations.]** *Dokl. Akad. Nauk SSSR* 102 (4), 1955 (841–4). 3 refs. [Russ.] [Belorusskiĭ Naučno-issledovateljskiĭ Institut Lesnogo Hozjaĭstva, Gomelj.] A.P.B.

[Cf. *For. Abstr.* 17 (Nos. 231–2).] Observations on 58 plots in plantations in several types of Oak site in Belorussia showed that in early youth the mean diameter of Oak in (*a*), patch plantations, was greater, and its mean height less, than in (*b*), line plantations. In (*a*), however, the height growth of the best trees at the centre (protected by their neighbours from the competition of other woody and herbaceous vegetation) was as good as that in (*b*), and the latewood % of such trees was ca. 87% compared with 80% for (*b*). Tabulated figures for 22-year plantations (means of 1350–2500 trees in each of several forest types) show mean diameter increments for (*a*) exceeding those for (*b*) by 0·03 to 0·14 cm., while the mean height increment of (*a*) differed by − 3 to + 3 cm. from that of (*b*). Root studies in [ca. 10-year?] patch plantations indicated that the thriftiest trees in the patches had 4–8 times the root weight per tree of the less thrifty classes, and a higher proportion of this weight (77 versus 54–56%) was distributed in the humous upper 30 cm. (A horizon) of the soil. At 8–10 years, mortality in the patches was as much as 80%. The role of natural root grafting [cf. *For. Abstr.* 16 (No. 3887)] is briefly noted; excavations showed that the grafts occurring as early as 3 years of age were not functional unions, whereas at 20 years it was possible to demonstrate the passage of a dye solution from vessels of one to those of another root.

232.4. Formation of Stands by Planting

See also Nos. 285, 339.

232.41. Planting Stock (Type, Handling and Treatment)

See also Nos. 385, 677.

370. READ, R. A. **Grading of transplants may improve initial survival of Ponderosa Pine in Plains windbreaks.** *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 16, 1955. pp. 2. 1 ref.

Compares first-year survival of graded (seedlings having greatest top and root size and stem circumference) and ungraded 2 + 1 stock.

371. WILNER, J. **Study of effect of storage and time of transplanting on survival of certain broadleaf and evergreen seedlings.** Forest Nursery Station, Indian Head, Saskatchewan. 1953. pp. 1 + 3 tbls.

Gives tabulated data from 3 years' studies on *Caragana arborescens*, *Acer negundo*, *Fraxinus pennsylvanica* var. *lanceolata*, *Ulmus americana*, *Pinus sylvestris*, *Picea glauca* and *P. pungens*, in prairie conditions.

372. KRISHNASWAMY, V. S., and DABRAL, S. N. **The life of stumps of some forest species under moist and dry conditions.** *Indian For.* 81 (7), 1955 (408–10).

With a view to determining the viability of stumps (root-and-shoot cuttings) and the circumstances under which this could be prolonged, certain experiments were carried out in the demonstration area of the Forest Research Institute, Dehra Dun. According to these experiments, the stumps of *Syzygium cumini, Cedrela toona, Dalbergia sissoo* and *Bischofia javanica* may be stored for > 3 weeks after they are prepared, if kept moistened with water. Stored dry, they remain good for 3–4 days only. *From authors' summary.*

373. GRINNELL, W. R. **Planting stock dropped by air.** *Tree Plant. Notes* No. 20, 1955 (26–7).

In spring 1953 a test was made by the Ontario Department of Lands and Forests to determine the feasibility of air delivery of planting stock packed in bales. Burlap-covered bales, 16 in. in diameter to allow of their being dropped through the camera hatch of departmental aircraft, were prepared. Over 10,000 baled trees were dropped, by 3 methods, using 8- and 11-ft. parachutes and by free-dropping. Baled trees were also sent by boat and overland as controls. So far there is no difference in survival of trees delivered by the different methods. Free-dropping is better than parachute dropping because it is more accurate, eliminates the cumbersome parachute, and reduces flying time to a minimum.

374. FOWELLS, H. A., and SCHUBERT, G. H. **Planting trials with transpiration retardants in California.** *Tree Plant. Notes* No. 20, 1955 (19–22). 1 ref.

Experiments with 3 commercial transpiration inhibitors (an emulsified wax, a vinyl latex, and lanolin) at the California Forest and Range Experiment Station gave negative results, and it is questioned whether transpiration retardants as ordinarily applied to lifted trees are consistently beneficial in California.

375. JACK, J. B. **Tests of a transpiration inhibitor.** *Tree Plant. Notes* No. 20, 1955 (23–5).

Two trials were made at a state nursery in Victoria (Australia) on the effects of a transpiration inhibitor, S/V Ceremul 'C', on survival of 1-year seedlings of *Pinus radiata* shipped by road or rail during the winter (when this species continues to grow in Victoria). Survival was not affected by treatment. A trial at the end of the summer indicated that at that season treatment had a moderately beneficial effect.

232.42. Methods of Planting (including Use of Fertilizers etc.)

See also Nos. 390, 651.

376. HOVIND, J., and SCHOLZ, H. F. **Effect of the micro-site on the condition and early growth of planted Black Spruce.** *Tech. Note Lake St. For. Exp. Sta.* No. 434, 1955. pp. 2. 1 ref.

Results at the end of the second growing season show that 2 + 1 Black Spruce [*Picea mariana*] made better growth on furrow slices than in furrow bottoms in N.E. Wisconsin.

377. **Proposed safety rules for the operation of mechanical tree planters.** *Tree Plant. Notes* No. 20, 1955 (18).

232.43. Spacing and Arrangement in Plantations

See also Nos. 297, 367–9.

378. BYRNES, W. R., and BRAMBLE, W. C. **Growth and yield of plantation grown Red Pine at various spacings.** *J. For.* 53 (8), 1955 (562–5). 4 refs.

Continues the record [cf. *For. Abstr.* 11 (No. 1013)] of the *Pinus resinosa* spacing trials to the 30th year. Diameter growth has been consistently greater at the wider spacing, as has height growth from the 16th year. The volume production at 30 years in cords/acre of stems ⩾ 7 in. d.b.h. for the 10 × 10, 6 × 8, 6 × 6 and 5 × 5 ft. spacings were respectively 34·8, 16·1, 7·2 and 5·2. Thus, at wide spacings, yields of merchantable pulpwood are possible with Red Pine in 30 years in Central Pennsylvania. Trees at 10 × 10 were particularly uniform; all other spacings suffered some windthrow in a severe storm.

379. ZAKOPAL, V. Vývoj hnízdových výsadeb proti jednotlivým sadbám na křivoklátských kalamitních holinách. **[Development of nest plantings compared with single plantings in the Křivoklátsko forest areas devastated by natural causes.]** *Lesn. Práce* 34 (2), 1955 (58–62). [Cz.]

Presents some results of the notch-planting of Scots Pine in 1952 and 1953 in the area of Křivoklátsko, known to have the most arid climate in central Bohemia. Multi-plant 'nests' were superior to single plants in rooting, diameter, height increment and lateral growth. [Cf. *For. Abstr.* 17 (Nos. 366–9).]

380. FILHO, O. A. GURGEL. Observações no arboreto do Hôrto Experimental de Santa Rita do Passo Quatro. II. Nota sôbre o espaçamento inicial de casuarina, *Casuarina stricta* ((Dry) Ait.). **[Observations in the arboretum of the Experimental Station of Santa Rita do Passo Quatro. II. Note on the initial spacing of *C. stricta*.]** *Rev. Agric., Piracicaba* 30 (4/6), 1955 (79–84). 3 refs. [Port.] A.P.B.

A study of data obtained from 2 plots of *C. stricta* spaced (*a*) at 1 × 1 m. and (*b*) 2 × 2 m. indicated that, although at the end of the first year (*a*) showed superiority in height and diameter, its growth is overtaken and surpassed by (*b*) in the second year.

232.44. Season and Time of Planting

See Nos. 371, 384.

232.5. Artificial Formation of Stands by Vegetative Propagation

See Nos. 391, 458–9.

233. Afforestation

See also Nos. 40, 317–8, 740, 1111.

381. RUBNER, K. Die Wiederaufforstung in Bayern von 1948 bis 1954. **[Reforestation in**

Bavaria, 1948–1954.] Bayerischer Landwirtschaftsverlag, Munich. 1954. pp. 133 + 5 plates (4 coloured) + 3 maps. [G.] Price *DM* 11·50.

Primarily a historical, descriptive report (rather than a detailed guide to problems and technique, though containing much useful information on these) on the reduction of the clear-felled areas in Bavaria from ca. 100,000 ha. in 1948 to ca. 24,000 by the end of 1953. The main chapters deal with: the general background; execution of the work, with special reference to choice of species, soil preparation etc., injuries to which plantations are exposed, results by districts; and lessons for the future.

382. GRAVATO, A. M. Alguns aspectos do problema da arborização da Serra da Estrela. [**Afforestation of the Serra da Estrela.**] *Estud. Inform. Serv. flor. aqüic. Portugal* No. 49-*E*3, 1955. pp. 26 + 4 plates. 15 refs. [Port.] Limited distribution.

Discusses species suitable and success so far obtained in the Manteigas area, the climate, topography and vegetation of the area, and species suitable for further planting.

383. DEUTSCH, F. Il rimboschimento delle 'Coste' della Val Venosta. [**The afforestation of the steep southern slopes of the Val Venosta.**] *Monti e Boschi* 6 (8), 1955 (355–68). [It.]

Describes the work of afforesting 957 ha. of steep, arid slopes on the southern side of the Val Venosta in Bolzano Province. The work was begun in 1951. Preparation for planting included contouring with brushwood, some reinforcement with stone walls, and the installation of an irrigation system (22,107 linear metres of 0·5- to 3-in. iron pipes fed from springs by existing galleries cut in the rock), and the digging of planting holes. Tubed planting stock was used, species employed being *Pinus nigra* (65%), *P. sylvestris* (4·3%), *Larix decidua* (19%), *Picea abies* (2·7%), *Robinia pseudoacacia* and other broad-leaved species (9%). Beating up was done in 1952 and 1954. Some indications of costs are given.

384. OBRADOVIČ, M. Pošumljavanje u aridnim oblastima. Ubrzana sadnja pred jesenji period vegetacije. [**Afforestation in arid regions. Accelerated planting before the autumnal growth period.**] *Šumarstvo* 8 (3/4), 1955 (139–47). 6 refs. [Serb.e.f.]

The conventional planting time (November) for trees in the arid region of Titograd (Montenegro) frequently leads to failure. Since 1950 the author has tried planting *Pinus halepensis*, *P. pinaster*, *Robinia pseudoacacia* and *Cupressus* sp. at the end of the summer dormancy period, i.e. at the beginning of the autumn rainy season (September). Some 80–100% survival resulted, *P. pinaster* having the lowest figures. The soil was ploughed (or cultivated) in June–July and again after the first September rain. Planting 'swords' of simple design were used. In all ca. 300,000 plants were put in during 1950–52. Survival figures for November planting (in furrows) in 1926–28 varied from 12 to 28%.

385. PENO, D. Neke negativne pojave pri pošumljavanju trogodišnjim sadnicama crnog bora. [**Some unsatisfactory results when using 3-year-old *Pinus nigra* for afforestation.**] *Šumarstvo* 8 (3/4), 1955 (152–5). [Serb.e.f.]

Three-year-old planting stock often fails in some parts of S.W. Serbia having hard and rocky soil, because of the difficulty of rooting and the unfavourable combination of considerable height with undeveloped crowns. It is proposed to substitute 2-year-old plants with regularly developed crowns.

386. TRACI, C., and MUŞAT, I. Folosirea pinului negru şi a pinului silvestru la impăduririle terenurilor degradate. [**The use of *Pinus nigra* and *P. sylvestris* for the afforestation of degraded soils.**] *Rev. Pădurilor* 70 (5), 1955 (211–7). 7 refs. [Rum.]

Data are given from a number of plantations made with these Pines on eroded sites in the foothills of the Carpathians, and recommendations made for soil preparation (including terracing), methods of planting etc., and planting up to 50% of broadleaved species in mixture with the Pines.

387. LUPE, I. Z. Cercetări privind cultura speciilor de *Quercus* de diferite proveniențe în stepa centrală a Dobrogei. [**Studies on the growing of *Quercus* spp. of different provenances in the central steppe of the Dobrudja.**] *Bul. şti. Acad. Repub. rom. (Sect. Şti. biol.)* 6 (3), 1954 (803–36). 7 refs. [Rum.russ.f.] O.R.S.

A study of the behaviour of various Oaks in natural thickets and woods and old plantations in this region has been made by the Val Traian experiment station, with a view to finding seed sources for large-scale planting projects. The following conclusions are reached: *Quercus pubescens* occurs naturally on slopes and tablelands, occupying skeletal rendzinas in shady sites. It attains a height of not more than 8 m. and bears no fruit. *Q. pedunculiflora* grows in similar sites on rather moister degraded chernozems, where it attains a height of 8–15 m. and a ground-level diameter of 70–80 cm., bearing fruit often and abundantly. The variety *atrichoclados* f. *maxima*, which requires more moisture, should not be used. *Q. corcyrensis* (a hybrid of *Q. pubescens* × *Q. pedunculiflora*) is also suited to these sites. *Q. robur* may be used in the moister sites of the region but seed should be obtained only from stands growing at high altitudes and with a deep water-table. Hybrids of *Q. robur* and *Q. pedunculiflora* do better than *Q. robur* and can be used on *Q. pedunculiflora* sites. *Q. cerris* does well in stream bottoms on deep, moist soils. *Q. sessiliflora* should not be planted in this region.

388. SCHUDICH, N. Kopárfásítás a 'Hegyközi medencében'. [**Afforestation of barrens in the Hegyköz catchment basin.**] *Erdö* 3 (9), 1954 (304–8). [Hu.]

The deforested soils on rhyolitic and andesitic tuffs of the Hegyköz range (120–896 m.) are subject to much erosion, due chiefly to overgrazing. Eroding barrens on rocky ground are afforested with 2- to 3-year-old Scots and Austrian Pine seedlings planted in holes 40–50 cm. deep, made with a pickaxe and filled with humous soil; planting is sometimes preceded by stabilization of the scanty soil with drought-resistant *Fraxinus ornus* on slopes not exposed to severe frost. Conifers, including Norway Spruce

on the more humid slopes, are planted on terraces in coarse debris, with a preparatory planting of Robinia, protected against rain-wash by wattle fencing, on deeper hillside soils. *Quercus sessiliflora* has been successfully established by sowing on terraces cleared of deteriorated stands of Birch and Goat Willow.

389. BÁNKY, G. A Tokaji-hegy mikroklimájának megjavítása—fásitással. [**Improving microclimatic conditions of the Tokaj mountain by afforestation.**] *Erdö* 3 (9), 1954 (322–3). [Hu.]

Preparations are in progress for restoring ideal microclimatic conditions for the mould fungus *Botrytis cinerea*, causative agent of the specific drying process of Tokaj grapes on the vine stock. Reforestation of non-vineyard areas and establishment of a forest belt in the region are planned in order to provide, during the warm and dry atumn months, the atmospheric humidity now disappearing in consequence of excessive felling, grazing and drainage of flood areas.

390. NĚMEC, A. K otázce zalesnění kalamitních holin na Křivoklátsku. [**Afforestation of areas in Křivoklátsko denuded by natural causes.**] *Lesn. Práce* 34 (6), 1955 (269–74). [Cz.]

Experiments with *Alnus glutinosa*, *Tilia cordata* and *Acer negundo* have shown that afforestation can succeed even without mechanical soil preparation, provided that the planting hole is treated with ground limestone or with a basic rock meal of local origin (diabase, melaphyr). *Alnus* (and *Corylus*), as N-fixing species, should be given preference. [Cf. *For. Abstr.* 17 (Nos. 317–8).]

391. OHMASA, M. **Japanese experience in protective planting: erosion control in mountainous areas.** *Unasylva* 9 (2), 1955 (60–3).

Briefly describes methods of terracing, thatching etc., by way of preparing planting sites, species used, and sowing and planting methods. A note is given on a method of using both planting and sowing devised by an officer of the Maebashi Regional Forestry Office. It involves the use of 'vegetation blocks', which can be set out on either a terrace or a slope, and result in the rapid establishment of a vegetative cover. A mixture of earth (graded sand and topsoil), fertilizer (compost, $(NH_4)_2SO_4$, Ca superphosphate, straw, and dried grass), clay and water is kneaded together and compressed in moulds to produce a 'brick' measuring 33 × 20 × 2 cm. Five holes, 2 cm. in diam., are made in it at the time of moulding, penetrating it to allow stakes to be driven through and anchor the brick to the ground. At the same time the upper surface is pitted with 300 small holes (top diam. 6 mm.). A mixture of seed and wood ash is spread over the surface, filling the small pits, and the block is then lightly pasted over with clay and water. The blocks are set out on the slope and staked down with stakes of *Deutzia crenata* and Poplar, which themselves in due course root and sprout. The mixture of seeds contains seeds of hardy and less hardy, erect and spreading grasses and herbaceous plants with forest tree seeds added. The following is a common mixture: *Podocarpus nagi*, *Arundinella hirta*, *Cyphopogon goeringii*, *Lespedeza cuneata*, *L. bicolor*, *Alnus hirsuta*, *Pinus densiflora*, *P. thunbergii* and *Quercus variabilis*.

392. ***Patana* afforestation.** *Rep. Conserv. For., Ceylon 1953, Part 2*, 1954 (23–4).

A mechanical afforestation scheme for both wet and dry *patanas* was initiated in 1953 under the direction of an FAO expert. In the wet *patanas* a Caterpillar D-2 tractor and disc harrow were used to cultivate the soil to a depth of 9–12 in. This operation is necessary to turn up and expose the moist, peaty soil in order to make it suitable for planting. The ploughing was completely successful in removing the surface *patana* grasses and destroying their roots. A further working of the soil by rotavator reduces the soil to a fine tilth and remove any remnants of grasses and weeds. Planting takes place during the S.W. monsoon season, and *Acacia decurrens* is sown as a 'filler' species and soil improver. On the dry *patanas* a light Farmall tractor with a tined cultivator was used to turn over the soil to a depth of 6–8 in. in two operations—along the contours and obliquely. This depth is adequate to remove all roots and grass and uproot bracken rhizomes.

393. YOUNGBERG, C. T. **Some site factors affecting the success of reforestation and afforestation activities in the Willamette Valley foothills.** *Proc. Soil Sci. Soc. Amer.* 19 (3), 1955 (368–72). 8 refs. O.R.E.

A preliminary report on studies of soil moisture relations and the physical factors affecting them on 4 areas where first- and second-year mortality among Douglas Fir plants had been high. Soil profiles are described and results of laboratory analyses, including mechanical analysis, bulk density, range of available moisture and nutrient status, as well as several seasonal moisture curves, are presented, pointing to the importance of readily available water, i.e. water held at low tensions in the surface layers.

394. LOWRY, G. L., and YOUNGBERG, C. T. **The effect of certain site and soil factors on the establishment of Douglas-Fir on the Tillamook Burn.** *Proc. Soil Sci. Soc. Amer.* 19 (3), 1955 (378–80). 7 refs. O.R.E.

A preliminary report on studies in the relationship of soil moisture and seedling survival in N.W. Oregon. Soil texture, aspect, and slope affected survival by producing various rates of soil moisture depletion, the most probable cause of mortality. *From author's summary.*

234. Formation of Forest by Natural Succession

395. GLIŠIĆ, M. V. Problem pošumljavanja šumskih požarišta. [**Problem of afforesting burnt forest areas.**] *Šumarstvo* 8 (3/4), 1955 (115–24). 19 refs. [Croat.f.g.]

The following factors affect such afforestation: extremes of temperature, desiccation of the top soil layer, physical and chemical degradation of the soil due to wood ash, strong alkalinity, and lack of cover and mycorrhizae. Analysis of the natural development of forest vegetation in burnt areas points

to the existence of two different development types. One of them leads through the pioneer communities of *Populus tremula*, *Betula* spp., *Salix caprea* and *Sambucus* spp., while the other (on burnt areas developing into pasture land) is colonized by various *Juniperus* spp. Measurements of the annual increment of naturally-sown (3- to 5-year-old) *Abies alba*, *Picea abies* and *Pinus sylvestris* on sites without cover (I), or with a cover of *Epilobium angustifolium* (II) or of the pioneer species (III) show that the maximum increment of I and II is roughly equal to the mean increment of II and III, respectively.

396. BRAMBLE, W. C., and ASHLEY, R. H. **Natural revegetation of spoil banks in Central Pennsylvania.** *Ecology* 36 (3), 1955 (417–23). 6 refs.

An investigation was made on 20 spoil banks from 2 to 35 years old. The stocking with trees averaged 36·2% and was of low value for production of wood products.

235. Underplanting, Advance Planting etc. Nurses and Formation of Mixtures. Interplanting of Inferior Growth

See also Nos. 207, 231, 275, 337, 401, 460, 541.

397. HUCKENPAHLER, B. J. **Underplanted Loblolly Pine responds to delayed release.** *J. For.* 53 (7), 1955 (512). 1 ref.

[Cf. *For. Abstr.* 15 (No. 3570).] In 1941, *Pinus taeda* were planted at 1200/acre under low-grade ridge hardwoods averaging 228 stems/acre with 59 sq. ft. of basal area in stems > 0·5 in. d.b.h. All the latter were poisoned, girdled, or felled on some plots in 1948. Released Pines had by 1953 put on highly significant or significant increases in diameter, basal area, and height (figures given) compared with untreated controls. Mortality in treated plots from falling stems and tops of the overstorey was 12% against 10% from suppression and competition in the unreleased plots, a difference not statistically significant.

398. GÖHRE, K. Kleinklimatische Untersuchungen auf einer Kiefernkultur unter Birkenvorwald. **[Microclimatic investigations in a Scots Pine planting under a natural nurse crop of Birch.**] *Arch. Forstw.* 3 (5/6), 1954 (441–74). 12 refs. [G.]

From a 6-months' investigation at Eberswalde, it is concluded that the light-demanding Scots Pine, adapted to the extremes of heat and cold of the continental climate of its natural range and able to regenerate without shade, is definitely handicapped by a Birch nurse crop under the conditions studied (dry plain soils of the diluvium with relatively low rainfall). The Birch nurses compete for water, soil nutrients, and light, and create conditions that favour needle-cast. This conclusion is not applicable to other chief timber species in Germany, nearly all of which incline more to the atlantic type of climate and are more frost-tender. Graphs show the hourly or daily course of temperature at various soil depths and heights above ground, humidity, wind speed and evaporation, in the open, under the nurse crop, and in the edge and centre of gaps within it. Only moderate improvement in the forest climate could be attributed to the nurse crop (short and full of gaps), while that of the gaps in it was more extreme than in the open. The growth of the Pines was adversely affected in direct proportion to the proximity of the 'protecting' Birch.

399. STOECKELER, J. H. **Cover crops afford first-year protection for forest plantations against late spring frosts.** *Tech. Note Lake St. For. Exp. Sta.* No. 432, 1955. pp. 2.

In experiments in N.E. Minnesota, considerable protection against late frost was given by rye, 18 in. high and densely sown, to Sugar Maple, White Ash and White Spruce seedlings 6–8 in. tall.

400. PIEROVICH, J. M., and HUNT, L. O. **A nurse plant for Douglas Fir establishment—an experiment in applied ecology.** *Abstr.* in *Bull. ecol. Soc. Amer.* 36 (2), 1955 (54). A.P.B.

Death of newly germinating Douglas Fir seedlings due to high soil surface temperatures on south-facing slopes is a critical forestry problem in Oregon and Washington. Oregon State College, the U.S. Bureau of Land Management and the U.S. Forest Service are co-operating in research to overcome this problem. *Brassica juncea* has shown promise as a possible nurse plant.

236. Care of Regeneration or Plantations in the Initial Stages of Establishment (including Regeneration Surveys)

See Nos. 297, 399–401, 525 *et seq.*, 697, 713.

237. Amelioration of Forest Sites

See also Nos. 218, 738.

401. **Eradication of *illuk* [*Imperata cylindrica*] in Teak plantations.** *Rep. Conserv. For. Ceylon 1953, Part 2*, 1954 (26–7).

Successful experiments in eradication have been made by cultivating plantations with a Ferguson tractor and rotavator, which almost completely removed the *illuk* to a depth of 6 in. Wear and tear on the rotavator were, however, severe, and a disc harrow has been substituted; this, though not quite as effective, is efficient enough and much more robust. Cultivation is followed immediately by sowing of *Tephrosia candida*, which requires only moderate rains. Seed is dibbled in at 2-ft. intervals. The establishment of this leguminous cover effectively keeps out the *illuk*. A notable result of the operation was the appearance of Teak regeneration throughout the cultivated area.

402. LUKKALA, O. J. Maanparannusaineet ja väkilannoitteet metsäojituksen tukena. **[Soil-improving substances and fertilizers as an aid to forest drainage.]** *Metsät. Aikak.* 1955 (6/7; 8), (189–91; 273–6). [Fi.fi.e.]

Reviews experiments made by the Forest Research Institute to improve forest growth where drainage alone is not effective. Results indicate that a layer of sand, 5 cm. thick (500 cu.m./ha.), or of clay, considerably increases forest growth. A lime layer, e.g. crushed limestone at ⩽ 4000 kg./ha., retards the growth of, and sometimes kills, sphagnum on acid swamps (pH < 4) but hardly affects tree growth.

Wood ash at ⩾ 3000–4000 kg./ha. converts most drained swamps that have stayed treeless into excellent woodland. Preliminary experiments with fertilizers indicate that K and P fertilizers, e.g. 200 kg./ha. of potassium oxide (K_2O 50%) and 500 kg./ha. fine phosphate (P_2O_5 30%), cause a considerable increase in forest growth on swamps with poor nutritive properties. [Cf. *For. Abstr.* 16 (No. 457).] *From author's summary.*

403. THEMLITZ, R. Die Anwendung von Kalkstickstoff zur Rohhumusumwandlung und Ertragssteigerung im Walde. **[The use of $CaCN_2$ for converting raw humus and increasing yields in the forest.]** *Z. PflErnähr. Düng.* 64 (1), 1954 (54–66). 17 refs. [G.g.] [Institut für forstliche Bodenkunde, Hann. Münden.] O.R.S.

Applications of fertilizer were made experimentally in a 60-year-old Spruce stand in 1950. In a separate experiment, Spruce raw humus readily absorbed NH_3 gas; this treatment increased the base-exchange capacity and the quantity of citric-acid-soluble phosphoric acid of the humus. Results in the stand after 2 and 3 years showed that application of $CaCN_2$ at the rate of 120 kg. N/ha. favoured the production of humus rich in N, and an increase in the base exchange capacity and in the content of phosphoric acid, but did not create conditions for biological conversion of the raw humus. Liming in addition to the application of $CaCN_2$ created conditions for rapid conversion of the humus, liming alone being less effective. All 3 treatments increased the P_2O_5 content of young needles to about the same extent. The combined treatment increased the % of CaO (though less than liming alone), MgO, MnO and SiO_2 in young, 2- and 3-year-old needles, but decreased that of K_2O. The combined treatment, but not the single treatments, increased the basal-area increment.

404. GALOUX, A. La fertilisation minérale en sylviculture. **[The use of mineral fertilizers in forestry.]** *Bull. Soc. for. Belg.* 62 (8/9), 1955 (361–81). [F.]

Reviews in outline experiments made in Belgium, which have been discussed by the author in detail in a separate publication. [Cf. *For. Abstr.* 16 (No. 2997).]

405. GAMBI, G. Essais comparatifs d'engrais, en surface et en profondeur, en populiculture specialisée. **[Comparative trials of fertilizers, applied on the surface or in holes, in specialized Poplar growing.]** [*Pap.*] *8th Sess. int. Poplar Comm., Madrid 1955*, No. *FAO/CIP/79-E*, 1955. pp. 6. [F.]

Experiments in the application of a complete NPK fertilizer, to 1-year-old plantations of 3 different clones of *Populus* '*canadensis*', (1) scattered on the surface, in a radius of 50 cm. from each tree, and (2) put in holes at a depth of 20–30 cm., and 40 cm. distant from the tree at a rate in each case of 2 kg./tree, showed no significant difference between the two methods. Fertilizer treatment produced striking increases in diameter and height growth over controls.

238. Timber Plantation Crops requiring Special Treatment

See also Nos. 428–30.

406. LÓPEZ-CADENAS DE LLANO, F. Reboisement populicole en Espagne. **[Afforestation with Poplars in Spain.]** [*Pap.*] *8th Sess. int. Poplar Comm., Madrid 1955*, No. *FAO/CIP/75-K Add.* 4, 1955. pp. 8 [F.]

Notes on areas planted, choice of species, planting methods, spacing etc.

24. Tending of Stands and Trees

407. Voprosy rubok uhoda za lesom. **[Problems of intermediate fellings.]** *Lesn. Hoz.* 5 (11), 1952 (24–66). [Russ.]

A whole section of this issue is devoted to intermediate fellings and tree classification problems in the U.S.S.R., with articles under the following titles: 'Conference on intermediate fellings' (*Anon.*; pp. 24–7)—On 21–25 Oct., 1952, a conference was convened by the U.S.S.R. Ministry of Forestry to consider the draft of a new 'Instruction on intermediate fellings' [the Russian term denotes all such fellings from cleanings to improvement fellings, but the chief reference is to thinnings]. The guiding principle is stated to be the tending and improvement of the stand rather than the secondary aim of exploiting the intermediate yields, and the chief feature is a new tree classification, based on wide practical experience in the U.S.S.R., using only 3 classes: best trees, useful (including auxiliary) trees, and trees to be removed. It is intended to keep the recommendations as simple and as general as possible in accordance with the wide variety of conditions to which they must apply, and to leave the application of the broad directives to authorities on the spot. Recent new proposals such as those of Nesterov, Danilov and Voropanov [see below] must be thoroughly tested by research establishments and, experimentally, under actual production conditions, before they can influence practice. 'New methods of improving the quality and productivity of forests' (*V. G. Nesterov*; pp. 28–35).—Expounds the author's views on tree classification and the corresponding modifications that he sees as necessary in the practice of intermediate fellings, based on either (*a*) size (five classes), with sub-classes distinguished as of retarded or rapid development [this classification is not discussed in detail] or (*b*) height growth (three classes), with sub-classes distinguished as under (*a*). The bulk of the paper is devoted to the distinction between the two sub-classes in each main class—a distinction which is seen in terms of 'physiological stage of development' (relative juvenility or senility)—and characters are listed by which it is thought the physiological age of trees can be inferred, e.g. seed-bearing, shape and other characters of the crown, thickness and fissuring of bark, of which it is believed that seed-bearing should serve as a reliable index in practice without resort to the other characters. The central point is that trees usually classed as dominants may be declining in vigour, and suppressed trees may be 'physiologically young' and so capable of better growth if freed. On this basis, two methods of making intermediate fellings are

discussed under the names 'physiological rejuvenation' (i.e. removal of the 'physiologically old' trees to favour the 'physiologically young') and 'liberation' (more suitable for mixed stands, and implying the favouring of the best trees of the main species by removal of accessory species interfering with them, with due consideration of 'physiological age' etc.).

'Classification of trees by their productivity in even-aged stands, and an experiment in applying such a classification' (*B. D. Žilkin*; pp. 35–41).—Criticizes the new Instruction and proposes a tree classification based on total organic-matter production (crown, stem and roots), distinguishing 5 'productivity' classes which are illustrated in tables and a figure based on a 35-year Scots Pine stand in Byelorussia [the statistical basis of the data is not given, nor is it entirely clear what represents actual measurements and what rests on calculations based partly on other literature]. The figures given relate to: organic matter in kg.; foliage area and chlorophyll content; absorption of solar radiation; interception of precipitation, transpiration; turnover of main nutrients; relative stem volume per tree, distribution of volume and number of trees in the stand, and correlation of relative values for stem volume and d.b.h., based on those for 'productivity' class III as unity; and a tabular comparison of the stocking of a sample plot by the old Kraft and the new 'productivity' classes. With the mean class III tree—assumed also to represent the mean tree of the stand—as unity, the relative values for volume and (in brackets) d.b.h. of the 5 classes are respectively 2·4 (1·6), 1·6 (1·3), 1·0 (1·0), 0·6 (0·8) and 0·4 (0·6). Thus for this classification it should be sufficient to know the d.b.h. of the mean tree of the stand, the remaining values then being found by the relative factors quoted.

'Tree classification by growth and development as applied to Oak woods' (*M.S. Černobrovcev*; pp. 42–4)—Though adhering to the idea of classification by 'physiological age', as judged by external characters such as height growth and crown characters, the author points out difficulties in applying Nesterov's tree classification to pure or mixed Oak woods of coppice origin, with examples from Voronezh Province, giving the distribution of modified Nesterov tree classes in such stands [but no figures in evidence of actual effects of the proposed treatments]. 'An experiment in the application of new methods for intermediate fellings' (*N. A. Kazanskiĭ*; pp. 45–7)—Details the results of applying Nesterov's 'rejuvenation' and 'liberation' fellings, compared with those of thinning from below and crown thinning in Pine and Pine/Birch stands in Moscow Province, trees being classified by both the Nesterov and Kraft systems, their 'physiological age' under the former being assessed by the number of cones on sample trees. The data given relate to effects on the constitution of the growing stock [with no data for effects on subsequent growth].

Two further papers (*A. P. Gračev*, pp. 48–51; *N. P. Georgievskiĭ*, pp. 51–8) both severely criticize Nesterov's proposals, agreeing that there is no good evidence that the characters used do indeed indicate 'physiological age'. The new classification is regarded as obscure and not well founded, and the 'rejuvenation' and 'liberation' fellings probably differ little, if at all, from thinning from below and crown thinning. Georgievskiĭ states that what is true in Nesterov's proposals, is not new, and what is new is unclear, unproven or untrue. Both authors defend the new draft Instruction as practical and workable.

'A reply to adherents of "pure" silvicultural practice' (*P. V. Voropanov*; pp. 59–63)—A polemical reply to attacks, in particular by Georgievskiĭ, on the author's theories, which resemble those of Nesterov in attempting to deduce 'physiological age' from external characteristics and to use this concept in tree classification.

'An essential observation on the biological foundation of intermediate fellings by V. P. Voropanov's method' (*I. I. Orlov*; p. 63)—Stigmatizes Voropanov's conception of the relation between tree size and 'physiological age' as erroneous and emphasizes that no reliable external characters have yet been found for distinguishing between early- and late-maturing individuals. Orlov's own studies in even-aged Pine stands have shown that, irrespective of size, some trees are early-maturing or 'physiologically old' at least in the sense that they have a much higher heartwood/sapwood ratio than others; he therefore suggests that such trees shall be the first to be removed from the stand, for which purpose it would be of interest to try to discover external features correlated with heartwood ratio. 'The theory and practice of intermediate fellings' (*I. N. Bakulin*; pp. 64–6)—Rejects Voropanov's theories as speculative and unsupported by experimental evidence, claiming that Voropanov's method of treatment would greatly resemble crown thinning. In particular, the evidence of seed-bearing as an index to physiological age is disputed and it is further emphasized that even if suppressed trees were 'physiologically younger', no evidence is offered on how long they would take to reach the upper canopy when released. Physiological maturity should be no reason for removing a tree if the tree is good and is still putting on valuable increment. The whole complex of problems needs far more research to produce factual data, and in the meantime the draft Instruction is endorsed as a general guide to practice.

241. Cleaning

408. ANDERSSON, S.-O. Ett 30-årigt plantröjningsförsök på Frösön. **[A 30-year-old cleaning experiment on Frösö.]** *Skogen* 42 (18), 1955 (332–3). [Sw.]

The area studied was sown with Pine in 1905 to give a spacing of 1·2 m. A few sections were cleaned in 1922, leaving the best plants at 4000/ha., the rest of the area being left untouched. Average height after cleaning was 2·8 m. Examination in 1954 showed that a cleaned and an uncleaned plot contained roughly the same volume, 256 and 260 cu.m./ha. but ca. 3600 and 12,000 stems/ha. respectively. Distribution diagrams showed the uncleaned plot to have 30 cu.m. timber in the 4·5–6·4 cm. diam. class, 55 cu.m. in the 6·5–8·4 cm. class, 8 cu.m. in the 17·5 and none in the 19·5, while corresponding figures for the cleaned plot were 4, 15,

45 and 24 cu.m. A study of the site quality of the two plots suggests that the differences in volume distribution are almost entirely the results of the early cleaning.

242. Thinnings

See also Nos. 514, 716, 774–5, 822, 854.

409. HILEY, W. E. **The thinning of plantations.** *Irish For.* 12 (1), 1955 (3–11). 8 refs.

An address given to the Society of Irish Foresters, arguing in favour of heavier thinnings than those employed by the British Forestry Commission.

410. MACDONALD, J. A. B. **[Review of *S. O. Heiberg:* 'Thinning—problems and practices in Denmark'.]** *Scot. For.* 9 (3), 1955 (140–1).

Cf. *For. Abstr.* 16 (No. 463).

411. ARMĂŞESCU, S. Efectul unei rărituri cu caracter relativ forte asupra creşterii unui arboret de brad. **[The effect of a moderately heavy thinning on the increment of a stand of *Abies alba*.]** *Rev. Pădurilor* 70 (6), 1955 (260–3). [Rum.]

Gives tabulated data on diameter distribution, diameter and volume increment, and basal area, of thinned and unthinned stands, 60–75 years old.

412. HUNG, L. B. **[Studies on the stand composition and growth of China Fir [*Cunninghamia lanceolata*] under experimental thinning.]** *Bull. Taiwan For. Res. Inst.* No. 39, 1953. pp. 33. 14 refs. [Chin.e.]

Statistical study of 4 small plots in a 25-year-old unthinned plantation, with 3 intensities of thinning and one control: d.b.h., total height, clear bole length, crown width, and volume. Results are discussed in the English summary. *From author's summary.*

413. COOPERI, R. W. **Pre-commercial thinnings of Pine bring earlier cash returns.** *Sth. Lumberm.* 191 (2386), 1955 (32).

Thinning a 10-year natural Slash Pine stand of 2 in. mean d.b.h. from ca. 3500 trees/acre to ca. 1200 at a cost of 1 man-day/acre, resulted 10 years later in a growing stock of 18 cords/ acre against 7 cords in an untreated stand, and in commercial thinnings of 3·3 cords/acre against nil, amply paying for the cost of the original, pre-commercial thinning.

414. WILE, B. C. **Thinning in a White Pine stand.** *Tech. Note For. Br. Can.* No. 5, 1955. pp. 3.

Two half-acre plots were established in 1937 in a 40-year-old stand, mainly of White Pine (*Pinus strobus*), that regenerated after fire. One plot was thinned in 1937, removing ca. 34% of total volume, and again in 1942, removing ca. 22%. Both thinnings were considered to have paid for themselves. The trees cut were mainly hardwoods and suppressed and defective conifers. Both thinned (*a*) and control (*b*) plots were remeasured at 5-year intervals and data are summarized in a table and graph. Thinning has increased the proportion of White Pine from 77% of total stand volume in 1937 to 96% in 1952, whereas on the control plot it remained fairly constant at 70%. Gross increment % for all species for 15 years was 4·5 for (*a*) and 3·5 for (*b*), and net increment was respectively 1240 cu. ft. and 540 cu. ft./acre, the greater relative net increment being due to the lower mortality on (*a*) (420 cu. ft./acre compared with 1040).

415. STEELE, R. W. **Growth after precommercial thinning in two stands of Douglas Fir.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 117, 1955. pp. 6.

A 20-year record of growth after a single light thinning in two stands, 23 and 30 years old at the time of thinning, indicates that thinning has not affected total cubic volume at the end of the period. Thinning has, however, apparently accelerated diameter and height growth and substantially increased the bd. ft. volume available in trees 7 in. d.b.h. and over.

243. Opening of the Canopy (Increment Fellings, Overhead Release and Improvement Fellings)

See also Nos. 274–5, 397, 533–4, 539–42, 549, 716.

416. GILBERT, A. M., WILSON, R. W., JR., and HUTNIK, R. J. **Growth behaviour of northern hardwoods after a partial cutting.** *J. For.* 53 (7), 1955 (488–92). 10 refs.

An analytical comparison of 15 years' growth of uneven-aged Beech, Yellow Birch, Sugar Maple, and Hemlock etc. on untreated plots, with plots from which 30% of the initial volume was removed, leads to the following recommendations: improvement cuttings of 25–30% on a cycle of ca. 10 years with extra sanitation cuts for Beech where *Nectria* attack demands it; stand composition to be improved to 30 and 20% of Maple and Hemlock respectively; basal area in stems ⩾ 5 in. d.b.h. to be maintained at 80 sq. ft./acre (or lower if bulk production is the aim); for average sites, 45% of the volume should be kept in medium (16–20 in. d.b.h.) and large (⩾ 21 in. d.b.h.) trees for a greater contribution to the allowable cut of quality veneer and saw logs.

417. HERMAN, F. R. **Use of ammate crystals for poisoning Ponderosa Pine in stand improvement.** *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 14, 1954. pp. 5. 2 refs.

NH_4 sulphamate was successfully used in poisoning undesirable trees in trials in 1948–49. Recommendations for application and dosage are made on the basis of research on the effect of tree vigour and crown character on the kill.

418. CURRY, J. R., and RUSHMORE, F. M. **Experiments in killing northern hardwoods with sodium arsenite and ammonium sulfamate.** *J. For.* 53 (8), 1955 (575–80). 13 refs.

Large cull trees of *Fagus grandifolia, Betula lutea* and *Acer saccharum* were treated with 50% solutions of Na arsenite or Ammate in bored holes of 9 ml. capacity at 4-, 8- or 12-in. intervals round the tree, 3 ft. above ground, at 8 different dates. The minimum dosage for satisfactory kills was 4 ml. of Na arsenite, spaced 8 in. apart. This compound is more effective than Ammate. Treatments made in full vegetation were more effective than during the resting period. [Cf. *For. Abstr.* 16 (No. 614).]

419. **[Improvement fellings by poison in mixed forest.]** *Rep. For. Dep. Uganda 1954*, 1955 (9–10). [Cf. *For. Abstr.* 15 (No. 1361).] The following new technique was applied at the cost of 30s./acre on 350 acres of Budongo Forest, exploited 8–13 years ago: cutting small climbers and weed species to facilitate access for poisoning; spraying, direct on the bark of weed species and climbers 1½–24 in. diam., a 1% solution of butyl 2,4,5-T. Included in this cost were the semi-experimental operations of demarcation (by hoeing) of 10-chain-wide strips in sections and the detailed recording of the structure, composition, regeneration and number of trees poisoned. Similar work over 114 acres in the West Mengo forest, exploited 3–8 years ago, cost 16s./acre.

245. Tending of Trees, Pruning etc.

See also No. 566.

420. VENET, J. L'élagage artificiel des peuplements résineux. **[The pruning of coniferous stands.]** *Rev. for. franç.* 7 (8), 1955 (607–20 + 4 photos). 4 refs. [F.]

A general discussion of aims, methods etc.

421. MINCKLER, L. S. **How tree size affects time needed to prune Shortleaf Pine.** *J. For.* 53 (9), 1955 (665–6).

The dead lower branches in 10- to 15-year *Pinus echinata* persist at 800–1000 stems/acre. A 6-acre pruning trial in such a stand showed that pruning when trees are 3 in. in d.b.h. is most economical. One axeman knocked off dry limbs while his mate, using a curved saw on a 4-ft. handle, raised clean bole height to 8 or 9 ft. with the removal of $< \frac{1}{4}$ of live crown. A graph shows the man-minutes/tree required for mean d.b.h. from 2 to 4·5 in.

422. BENNETT, F. A. **The effect of pruning on the height and diameter growth of planted Slash Pine.** *J. For.* 53 (9), 1955 (636–8). 9 refs.

In a 4-year statistical study, 5- and 11-year plantations of *Pinus elliottii*, at respectively 10 × 10 and 15 × 15 ft., with mean crown ratios of 89 and 72%, were pruned to remove 35, 50, 65 and 80% of the live crown. Even the severer prunings had little effect on height growth but the removal of 50% in the younger and as little as 35% in the older plantation resulted in a significant decrease in diameter growth. This last rises rapidly as the crown ratio increases from 10 to 50% but thereafter very gradually. These reactions to pruning are paralleled in *P. palustris*. For the greater production of clear lumber and more rapid occlusion with no increase in cost or decrease in growth, the following two-stage schedule is recommended for wide spacings on good old-field sites: Prune when trees are 5–6 and 10–12 years old, when they are respectively 15–18 and 33–36 ft. high, to leave a minimum crown ratio of 50%, i.e. first to 8 ft. then to 17 ft.

25. Treatment of Defective, Derelict or Very Open Stands

See also No. 460.

423. DEDIU, A. Contribuţii la ameliorarea arboretelor degradate din lunca inundabilă a Dunării şi din luncile riurilor (zăvoaiele de salcie şi plop). **[The improvement of degraded forest on floodland and river banks in the Dunarii region (Willow and Poplar stands).]** *Rev. Pădurilor* 70 (5), 1955 (209–11). [Rum.]

26. Combinations of Forestry with Agriculture and Pastoral Husbandry (Including Shelterbelts and Their Treatment)

261. Alternate Forestry and Agriculture, Periodic or Temporary Agricultural Use of Forest Land

See also Nos. 1093–5.

424. GUILLOTEAU, J. **Scheme for the improvement of the agricultural economy of Senegal.** *Sols Africains, Paris* 3 (2), 1954 (182–235). [F.E.]

Among 12 cultural, soil-improvement and protection measures recommended, are contour planting of live hedges and trees and the use of tree legumes in the rotation. For the former, *Cassia siamea*, *Anacardium occidentale*, *Acacia* (*Faidherbia*) *albida*, Mangoes, *Jatropha curcas*, *Prosopis* sp. and *Parkia biglobosa* are listed. For the latter, *Acacia albida* is of considerable importance; at 15 trees/ha. 'one [year's] fertilization by grazing animals every 80 years is sufficient and the land may be continuously cultivated without fallows'. The application of grazing for such a purpose is not at present intensive enough to ensure this. Sketchmaps showing soil exhaustion and soil pH are included.

425. STANER, P. Les paysannats indigènes du Congo belge et du Ruanda-Urundi. **[Peasant farming schemes for Africans in the Belgian Congo and Ruanda-Urundi.]** *Bull. agric. Congo belge* 46 (3), 1955 (467–558). 44 refs. [F.flem.]

A comprehensive review with statistics of production, rotations, length of forest fallows etc., province by province, with details of the history, objects, initiation, social and economic development and future of the schemes.

262. Fuel and Fodder Forests

426. STANNARD, M. E. **Some fodder trees of western New South Wales.** *J. Soil Conserv. Serv. N.S.W.* 11 (3), 1955 (129–36). 5 refs.

Notes on *Brachychiton populneus*, *Acacia aneura*, *Heterodendron oleifolium*, *Geijera parviflora*, *Casuarina lepidophloia*, *Apophyllum anomalum* and *Eremophila longifolia*.

264. Farm Forests

See also Nos. 1097–8, 1100.

427. **Agriculture and forestry at a Cumberland hill farm.** *Ctry. Landowner* 6 (5), 1955 (291–2).

Note on successful planting of Spruce and Larch to provide shelter to stock on hill pastures, the Spruce mostly being harvested as Christmas trees, and Larch thinnings used for fence posts.

265. Strips or Lines at Road, Rail and Canal Sides, etc.: Hedgerow Trees

428. REGUERAL, A. G. Los chopos en los nuevos regadios de España. **[Poplars in the new irrigation areas of Spain.]** [*Pap.*] *8th Sess. int.*

Poplar Comm., Madrid 1955, No. *FAO/CIP/ 75-K Add.* 9, 1955. pp. 8. [Span.]

Gives some preliminary information on irrigated plantations of Poplar (× *Populus regenerata*, × *P. serotina*, *P. deltoides* var. *missouriensis*, and *P. nigra*) established in recent years in various parts of Spain.

429. TORROBA, J. F. L'influence du peuplier sur la richesse biogénique des eaux continentales. **[The influence of the Poplar on freshwater biology.]** [*Pap.*] *8th Sess. int. Poplar Comm., Madrid 1955*, No. *FAO/CIP/75-K Add.* 10, 1955. pp. 3. [F.]

Discusses the beneficial effect of trees (especially Poplars) growing on river and stream banks, on the fish population.

430. SANZ-PASTOR, D. J. M., and PIEROLA, F. DE. Les peupliers et l'hydrologie forestière **[Poplars and forest hydrology.]** [*Pap.*] *8th Sess. int. Poplar Comm., Madrid 1955*, No. *FAO/CIP/75-K Add.* 2, 1955. pp. 3. [F.]

A note on the planting of Poplars for the protection of stream banks in Spain.

266. Shelterbelts, Windbreaks

See also Nos. 25, 56, 424, 526, 547.

431. CADMAN, W. A. **Farm and forest: 2. Planting of shelterbelts. 3. Layout and choice of species for shelterbelts.** *Agriculture* (*J. Minist. Agric. Lond.*) 62 (2; 3), 1955 (92–3; 142–3). 1 ref. O.R.E.

Deals with advantages and disadvantages of shelterbelts in general and of solid versus permeable barriers, lay-out and shape, with special reference to the U.K. Species discussed include Japanese Larch, Sitka Spruce, *Pinus contorta* and Beech, a cautionary list (European Larch, Corsican Pine, Scots Pine, Ash and Birch) and various shrubs. Brief advice on planting and tending is also given.

432. WOODRUFF, N. P. **Shelterbelt and surface barrier effects on wind velocities, evaporation, house heating, snowdrifting.** *Tech. Bull. Kansas agric. Exp. Sta.* No. 77, 1954. pp. 27. 6 refs.

Wind-tunnel studies to compare the effects of solid barriers and tree shelterbelts with and without leaves, and single and successive fences, on wind velocities, and the effect of barriers on evaporation rate, consumption of BThU in house heating, and drifting of snow.

433. KRISTJÁNSSON, K. K. Tilraunir með skjólbelti á Sámsstöðum í Fljótshlíð. **[Experiments with shelterbelts at Sámsstöður in Fljótshlið.]** *Ársr. Skogræktarf. Íslands* 1955 (38–44). [Ice.]

Gives particulars of spacing, treatment (weeding and manuring), and heights (up to 3·5 m. after 15 years) of shelterbelts of Birch planted since 1940, with estimated costs, and tabulated figures showing, for 1945–46 and 1952–54 the increased yields of barley, oats and spring wheat in fields sheltered by a belt over those in unsheltered neighbouring areas.

434. GEORGESCU, C. C., LUPE, I., CATRINA, I., and MARCU, G. Influenţa perdelelor forestiere de protecţie asupra umezelii solului în imediata lor apropiere. **[The influence of shelterbelts on soil moisture in their immediate vicinity.]** *Bul. Şti. Acad. Repub. rom.* (*Sect. Şti. biol.*) 6 (3), 1954 (777–90). 7 refs. [Rum.russ.f.] O.R.S.

A study was made of the effects of the roots of woody species in shelterbelts on the soil moisture in their immediate vicinity. It was found that the effects of root competition appeared towards the end of summer and beginning of autumn. When a 10-m. strip adjacent to the shelterbelt was freed from root competition by trenching, the soil-moisture reserves during the growing season were 12–15% above those of soil not so isolated. The effect of root competition for moisture extended to a distance of twice the height of the belt, and to a depth of 1–120 cm.

435. LUPE, I., and MARCU, G. Contribuţii la cunoaşterea influenţei perdelor de protecţie asupra viilor de pe nisipurile mobile din sudul Olteniei. **[The influence of shelterbelts on vineyards planted on shifting sands in southern Oltenia.]** *Bul. Şti. Acad. Repub. rom.* (*Sect. Şti. biol.*) 7 (1), 1955 (47–57). 2 refs. [Rum.russ.f.] O.R.S.

Studies made on the State Farm of Tîmburești, led to the following conclusions: (1) The beneficial influence of shelterbelts was exercised equally on vineyards exposed to the prevailing winds (E. and W.) and to the N., and probably also to the S. and intermediate aspects. (2) The greatest influence was exercised on E. and N. aspects to a distance of 4*H* (*H* = height of belt), and on W. aspects to a distance of 8*H*. (3) An adverse influence is exerted on the vines for a distance of 10–20 m. This is more marked when belts are formed of Robinia (with a spreading root system) than with Pine (with tap roots). (4) In this region, N.–S. orientation is best, and the optimum spacing is at 200 m., with secondary belts at 200–400 m.

436. FEKETE, G. Védöerdöövezetek, mezövédö erdösávok tervezése a Bolgár Népköztársaságban. **[Planning of forest and field shelterbelts in Bulgaria.]** *Erdö* 3 (6), 1954 (199–201). [Hu.]

As a result of co-ordinated planning, nine forest belts ranging from 25 to 220 km. in length are being established in the Dobrudja, mainly against drought and the erosion of river embankments. The belts are 20–70 m. wide, some of them comprising fruit trees or vineyards bordered by wide bands of forest trees. The shelterbelts to be constructed round co-operative and state farms are 16–20 m. wide and consist of main belts 500–600 m. apart, set at right angles to the destructive winds, and of transverse subsidiaries set 1200–1500 m. from each other. [Cf. *For. Abstr.* 14 (p. 374).]

437. NIKITIN, P. L. Sozdaem gosudarstvennye zaščitnye lesnye polosy. **[Creation of State shelterbelts.]** *Lesn. Hoz.* 5 (10), 1952 (23–7). [Russ.]

An account by the Deputy Minister of Forestry, U.S.S.R., on the progress achieved in 1949–52 in the planting of State shelterbelts in the S.E. part of European Russia. The importance of proper tending of plantations in their early life is strongly stressed by the complete failure of recent attempts to raise trees in the steppes under the shelter of agricultural crops, in the belief that the crops would render weeding and other cultural operations un-

necessary. In consequence, the growing of agricultural cover crops in the wide interspaces between the rows of 'nests', with the introduction of auxiliary species and shrubs only 2–3 years later, is to be discontinued; in future the latter are to be planted simultaneously with the acorns, the plantations are to be kept well weeded, and all efforts directed towards promoting an early formation of canopy to help the plants in their competition against steppe weeds.

438. SAMOSADOWA, K. J. Die Waldschutzstreifen als zusätzliche Bienenweide. **[Shelterbelts as supplementary bee pastures.]** *Leipziger Bienenzeitung* 66 (10), 1952 (228–30). [G.] From *abstr.* in *Z. Weltforstwirt.* 17 (3), 1954 (107).

Describes the development of shelterbelts in the Rostov region. The belts (11 in a N.–S., 6 in an E.–W. direction) now measure 150 km. and cover 323 ha. They consist of 15 to 20 rows at 1·2–1·5 m. intervals and 0·7 m. between the trees. The outer rows are shrubs. Species include *Caragana arborescens*, *Fraxinus pennsylvanica*, *Gleditsia triacanthos*, *Fraxinus excelsior*, *Quercus robur*, Apricot, *Acer negundo*, *A. tataricum*, *A. campestre*, Apple, *Robinia pseudoacacia*, *Cornus*, *Rhus cotinus*, *Amorpha fruticosa*, *Elaeagnus angustifolia*. Several of these provide excellent bee pasture; for instance, one 20-year-old *Robinia* tree provided 4–5 kg. nectar during its 8- to 10-day flowering period, *Gleditsia* of the same age ca., 225 g. invert sugar (water-free nectar) and *Acer campestre* 175 g. The harvest per hive is stated to be 30–67 kg. honey and 0·7–1·25 kg. wax, according to shelterbelt composition.

439. POLJAKOV, A. M. Na trasse gosudarstvennoĭ zaščitnoĭ polosy Kamyšin-Stalingrad. **[Along the track of the Kamyshin-Stalingrad State shelterbelt.]** *Lesn. Hoz.* 5 (10), 1952 (28–30). [Russ.]

An account of its establishment, with special reference to the control of rodents and insect pests. Pine planted on unsuitable sites (chalk and limestone outcrops, dry sands long under *Elaeagnus*, compact sandy loams with Na salts) where the survival has been only 25%, is to be replaced by hardwoods; the need to take proper care of the young plants and especially of protecting Oak against frost is emphasized.

440. NAGOVICYN, N. A. Zaščitnye lesnye nasaždenija na Volge-Done. **[Shelterbelts in the Volga-Don region.]** *Lesn. Hoz.* 5 (11), 1952 (7–10). [Russ.]

Discusses the establishment of shelterbelts along the recently completed Volga-Don navigation canal and along the network of canals projected for the irrigation of 2,750,000 ha. of chestnut soils (locally with a tendency to saline or alkaline conditions) of the canal zone, and fed from the huge Tsimlyansk and subsidiary reservoirs. Shelterbelts along the navigation canal are intended to prevent silting, and to shelter the boats against the wind; those along the irrigation canals, chiefly to prevent waterlogging and salinification of the fields, some of the percolating water being used by the trees. Along the Volga-Don canal there are to be two shelterbelts running close to each other: one, 10·5–21 m. wide, is to be established by planting 4- to 7-year transplants in trenches filled with imported humous soil on the canal spoil banks; these banks, owing to their considerable salt content must be washed and drained before planting; the second, outer shelterbelt, 50 m. wide, is to be planted by the usual method and will serve to protect the spoil banks from wind erosion. For the Tsimlyansk reservoir which is 350 km. long, has an area of 2600 sq. km. and a capacity of 12·6 milliard cu.m., a preliminary survey estimated that 60,000 ha. including banks, ravines, and gulleys will require to be afforested within its basin, as well as 17,000 ha. of sands along its banks.

441. ARHIPOVA, N. K., and ZGIRSKIĬ, S. I. Opyt zaščitnogo lesorazvedenija v Azerbaĭdžane. **[An experiment in planting shelterbelts in Azerbaijan.]** *Lesn. Hoz.* 5 (10), 1952 (34–5). [Russ.]

The planting of 12 shelterbelts on a total area of 17,890 ha., mainly irrigated, was started in 1950. Of the 70 tree and shrub species that were selected, Oak is to be planted on the best soils, namely, those with a groundwater level > 2 m. below the surface; *Gleditsia* and *Ulmus* sp. on medium and highly saline soils requiring previous drainage and treatment; and Poplar and Alder on wet soils. In the 1950–51 plantations, harvesting of agricultural cover crops during the hottest time of the year left the young trees unprotected against sun scorch, which caused high mortality. With irrigation the sowing of acorns in furrows in groups of 6 seed-spots was found more suitable than 'nests' in quincunx, as the latter required watering of the whole area and not just along the furrows—leading to the silting and washing out of seed spots and even whole nests.

268. Pastured Forests. Grazing on Forest and Open Ranges, Forage Plants etc.

See also Nos. 107, 535–7.

442. MARTIN, S. C., DUNKESON, R. L., and BASKETT, T. S. **Timber harvests help offset forage decline in Missouri's managed forests.** *J. For.* 53 (7), 1955 (513–6). 7 refs.

Fire protection in the Missouri Ozarks forests (containing 5 species of Oak, *Carya* spp. and *Pinus echinata*), has thickened up woody growth with a consequent loss of grazing. The early effects of release on grazing are analysed, and the results are tabulated in species lists and graphed. Turfs, grasses and browse plants were increased by release. Deer are better able to use such small openings in managed forest than cattle. [Cf. *For. Abstr.* 15 (No. 2533).]

443. HALLS, L. K. **Grass production under dense Longleaf/Slash Pine canopies.** *Res. Note Stheast. For. Exp. Sta.* No. 83, 1955. pp. 2.

Data collected from a 3-year study of 326 plots on upland portions of mainly young stands on the Alapaha Experimental Range, Ga., showed that normal grass production of 1000 lb./acre (oven-dry) on open forest ranges declined consistently as overhead tree canopy increased from 5 to 35% (b.a. 92 sq. ft.) but tended to level off at ca. 300 lb./acre under still denser canopies.

444. FENNER, R. L., ARNOLD, R. K., and BUCK, C. C. **Area ignition for brush burning.** *Tech. Pap. Calif. For. Range Exp. Sta.* No. 10, 1955. pp. 10.

Discusses the precautions needed when burning is carried out by kindling many individual fires over an area simultaneously or in quick succession, methods and organization, the value of smashing down the brush with a bulldozer before burning and the extent of brush-smashing needed for different conditions.

27. Arboreta. Arboriculture for Ornamental Purposes. Hedges and Hedge Plants

445. **Ministry of Works 2nd report of the Advisory Committee on Forestry.** H.M. Stationery Office, London. 1955. pp. 16. Price 6*d*.

Includes a list of species suitable for planting in parks, avenues etc.

446. GEORLETTE, R. Essai historique sur les haies servant à la clôture des biens ruraux en Belgique. **[The history of hedges in relation to agricultural enclosure in Belgium.]** *Ann. Gembl.* 60 (3), 1954 (171–84). 36 refs. [F.] A.P.B.

447. WHITE, A. J. **Study of marginal and median tree and shrub plantings as safety barriers on highways. Primary report.** *M.V.R. Research Project, Motor Vehicle Research, Inc., Lee, N. Hampshire* No. 6072, 1953. pp. 8 + 31 photos.

Multiflora Rose has many of the desirable qualities for planting on the margins or between carriageways of motor roads. Experiments showed that a thicket of this species will stop a car driven at 20 m.p.h. in 2–3 ft., and at 30 m.p.h. in 10 ft., without injury to driver or passengers.

28. Husbandry of Forest Products Other than Wood

See also section 892.

282. Bark Crops

See also No. 1106.

448. NATIVIDADE, J. VIEIRA. Panorama da subericultura mediterrânea. **[Review of cork cultivation in the Mediterranean region.]** *Bol. Junta nac. Cortiça, Lisboa* 17 (199), 1955 (180–90, xlvii–viii, 38–9). [Port.e.f.]

Reviews briefly the history of Cork Oak cultivation in this region, and the area at present covered by Cork Oak stands, and discusses problems arising from the lack of inventories, the large areas under private ownership, relationship to agriculture and grazing, difficulties of regeneration, and pests and diseases.

449. SANTOS, J. BRITO DOS. O sobreiro no nordeste de Portugal. **[Cork Oak in north-east Portugal.]** *Bol. Junta nac. Cortiça, Lisboa* 17 (201), 1955 (245–6, lxiii–lxiv, 53–5). [Port.e.f.]

Cork Oak is widespread in north-eastern Portugal, as is illustrated by figures for production from 1944 to 1953, but in general Cork is only grown on soils unsuitable for other crops. The silvicultural requirements of the tree are discussed and some suggestions made for improvement of the stands.

450. GUERREIRO, M. GOMES. O sobreiro do carbónico a Sudoeste de Portugal. **[Cork Oak in the Carboniferous region of south-west Portugal.]** *Bol. Junta nac. Cortiça, Lisboa* 17 (201), 1955 (247–51, lxiv–v, 56). [Port.e.f.]

Discusses ecological, agrarian and sociological characteristics of this region, the present extent of the Cork Oak stands and their possible extension.

451. JAGNIČENKO, M. M. Razvedenie barhata amurskogo v Ukrainskoĭ SSR. **[Growing of *Phellodendron amurense* in the Ukraine.]** *Sbornik naučnyh Trudov kievskogo lesohozjaĭstvennogo Instituta [,Kiev]* 1953 (2), (68–102). 10 refs. [Russ.?] From *abstr.* in *Prehl. lesn. Lit.* 6 (2), 1955 (No. 497). [Cz.] P.R.

Biology and ecology of *P. amurense* in the U.S.S.R.; nurseries, planting, plantation types, tending, and harvesting of bark.

283. Fruit and Seed Crops

See also No. 1105.

452. RUSSELL, T. A. **The Kola of Nigeria and the Cameroons.** *Trop. Agriculture, Trin.* 32 (3), 1955 (210–40). 76 refs.

Four species and 3 varieties with edible seed are described, with a key to species and a comprehensive account of the cultivation and yield of *Cola nitida*, and notes on flowering conditions depressing its yields and on its heredity in seed colour.

284. Crops Tapped for Exudations

See also Nos. 165, 730, 804, 1092.

453. DAVID, R. Sur la cicatrisation des cares de pin maritime. **[The cicatrization of resin-tapping freshenings on *Pinus pinaster*.]** *C.R. Soc. Biol., Paris* 149 (1/2), 1955 (96–8). [F.f.] O.R.S.

Describes with drawings, cicatrization taking place when (1) bark, (2) bark + cambium, (3) bark + cambium + (*a*) 1–1½ mm. of wood, (*b*) 4–5 mm., or (*c*) 8–10 mm. are cut. No cicatrization took place with 3 (*b*) and (*c*).

454. SCHOPMEYER, C. S. **Effects of turpentining on growth of Slash Pine: first-year results.** *For. Sci.* 1 (2), 1955 (82–7). 9 refs.

Using vernier growth bands at three heights, on 5 groups of 25 twenty-year *Pinus elliottii*, the volume growth of the 16-ft. log (5–21 ft. from the ground) was compared in 4 resin-tapping treatments (2 conventional) and no treatment. The conventional methods resulted in a 26% reduction of growth in the first year. There was a high correlation between growth and intact circumference, but none with resin yield.

455. BENNETT, F. A. **Wolf trees—good gum producers.** *Naval Stores Rev.* 65 (3), 1955 (8).

Presents figures showing yields, costs and returns over 3 years from tapping 358 wolf Slash and Longleaf Pines averaging 14 in. in d.b.h. and overtopping a Slash Pine stand in Georgia. Yields are well above the average, and illustrate the advisability of allowing trees to reach as large a diameter before tapping as is compatible with good management.

456. ANDERSON, A. B. **Chemical stimulation for wood naval stores production.** *Naval Stores Rev.* 65 (5), 1955 (8–9). [Forest Products Laboratory, University of California, Berkeley.]

Tests were made on 3 Loblolly and 3 Slash Pines, which were wounded by driving a thin, sharp metal felling wedge at a slightly downward angle into the stem, ca. 16 in. above ground level and ca. 3½–4 in. deep beyond the cambium. The wedge was then removed and wounding continued until there was a continuous incision across ca. ⅓ of the circumference. As soon as wounding was completed, 40% H_2SO_4 was introduced into the incision until it was filled. Six months later, borings were taken at various levels above and below the wound and the samples extracted to determine the amount of crude resin present. This sampling and extraction procedure was repeated 1 year after the wounds were made. Considerable quantities of resin were produced within a period of a year over an area 12 in. above and 12 in. below the wound, the amount of resin produced being comparable with that found in old-growth southern Pine stump-wood used for resin extraction. Resin deposition did not take place radially beyond the wounded area. Experiments are in progress to determine how extensive the stimulated wounds can be made without killing the tree.

457. DAVID, R., and BERNARD-DAGAN, C. L'eau de pluie ayant séjourné en forêt dans les pots Hugues au contact de la gemme des pins maritimes est-elle toxique? **[Is rain water that has been in contact with resin of *Pinus pinaster* [tapped with acid stimulation] in Hugues containers toxic?]** *C.R. Soc. Biol., Paris* 149 (3/4), 1955 (364–6). [F.f.] O.R.S.

Rain water accumulated in the containers catching the resin on trees where H_2SO_4 had been used to stimulate the resin flow, was found to contain insufficient amounts of the acid to be harmful to sheep drinking from the containers.

458. DUDIĆ, M. Selekcija jako smolovitih borovih stabala. (Prethodna saopštenje). **[Selection of Pine stems for high resin yield. (Preliminary communication).]** *Šumarstvo* 8 (1/2), 1955 (61–3). 4 refs. [Serb.e.f.]

Brief account of attempts in Jugoslavia since 1952 at raising the yield of resin by grafting twigs from stems with high resin yield [no species given]. The technique of grafting was mastered after 2 years' initial failure.

459. DUDIĆ, M. Podizanje borovih sastojina sa visokim intenzitetom lučenja smole. **[Growing Pine stands with a high resin flow rate.]** *Šumarstvo* 8 (3/4), 1955 (148–51). 3 refs. [Serb.e.f.]

Suggests grafting twigs from high-yielding Pines on 3- to 4-year-old Pine in plantations.

285. Leaf Crops

460. **Reforestation of degraded forests.** *Rep., Conserv. For. Ceylon 1953, Part 2*, 1954 (25–6).

Experiments are being made in the reforestation of derelict Tea and Rubber estates. Observations on the area planted in 1952 showed that the most suitable species for interplanting in the Tea are *Cedrela serrata*, *Albizzia moluccana* and *Michelia champaca*, which are quick growing and able to outgrow the Tea and rank weeds.

287. Bamboo and Cane Growing etc.

461. **A useful product.** *Nyasald. Fmr. For.* 2 (2), 1954 (29–34). 1 ref.

Notes on silviculture of *Oxytenanthera abyssinica* with general remarks on some other Bamboos grown in Nyasaland.

288. Crops Grown for Animal Products

See Nos. 438, 1063–4.

289.4. Shade Trees for Crops

462. VERTEUIL, L. L. DE. **Further observations on a trial of trees as shade for Cacao.** *Trop. Agriculture, Trin.* 32 (3), 1955 (241–3). 1 ref.

In this trial of 15 trees for resistance to the fungus *Calostilbe striiospora*, associated with a disease of Immortelles (*Erythrina* species), the best at 10 years proved to be *Erythrina glauca* (crown spread, convenient height, admission of light). This is so far unattacked. *Peltophorum ferrugineum* is worth further trial.

463. LETOUZEY, R. Les arbres d'ombrage des plantations agricoles camerounaises. **[Shade trees for agricultural crops in the French Cameroons.]** *Bois For. Trop.* No. 42, 1955 (15–25). [F.e.span.]

Discusses the characters desirable in shade trees for Coffee and Cacao and gives notes on a number of species used for this purpose in the French Cameroons. A S. American species, *Albizzia malacocarpa*, which was very satisfactory and has been much planted, has recently become subject to severe attacks from a borer, *Pachystola mamillata*, and substitutes are being sought.

3. WORK SCIENCE (WORK STUDIES). HARVESTING OF WOOD : LOGGING AND TRANSPORT. FOREST ENGINEERING

30. Work Science (Work Studies): General

302. Man and Work (Physiology and Psychology)

See also No. 473.

464. HILF, H. H., and KAMINSKY, G. Aufgaben, Methoden, Grenzen und Bedeutung arbeitsphysiologischer Untersuchungen bei der Forstarbeit. **[Tasks, methods, limitations and implications of work physiology studies in forest work.]** *Z. Weltforstwirt.* 17 (5), 1954 (169–74). 29 refs. [G.g.e.f.]

Reviews the present state of knowledge in this subject, its objects and methods (including apparatus). The author stresses the need for investigations under extreme climatic conditions, e.g. the far north and the tropics, and, on the analogy of 'sustained yield', into life performance.

304. Hygiene. Safety. Accidents and their Prevention

See Nos. 377, 857.

307. Tools, Equipment, Machines and Working Animals: General

See also Nos. 273, 288, 344, 362–3, 503, 521–2, 528, 601.

465. **Equipment news.** *Unasylva* 9 (2), 1955 (84–6).

Descriptive notes, with photographs, of the following among others: the Conical Post Pointer, a cheap and simple apparatus for sharpening fence posts (E. Salthouse, 25 Westbourne Road, Urmston, Manchester); Roto-Speed, a machine for cutting undergrowth (Lilliston Equipment Co., Albany, Georgia, U.S.A.); cage wheels to be bolted over tractor wheels for use on bog and swampland (Catchpole Engineering Co. Ltd., Bury St. Edmunds, England); a brush-cutting chain-saw attachment (Lombard Governor Corp., Ashland, Mass.); Gasoline Wright Saw, a reciprocating saw based on the same principle as the hand saw, cutting at a speed of 160 strokes/sec. and designed to fell, limb, and cross-cut trees up to 30 in. diam. The saw is powered by a twin-cylinder, single firing, petrol engine; total weight 25 lb. (Wright Power Saw & Tool Corp., Stratford, Conn.); The Northgate wood chopper, designed to convert tree tops, branches, brushwood etc., into logs and kindling wood of 6 in. length, and driven either from the power take-off of a tractor or by its own self-contained unit (Gopsill Brown Trading Co., Severn Road, Gloucester, England); Scammel 6 × 6 'Constructor', a range of vehicles designed for heavy duty under 'off-the-road' conditions, which can be equipped with an extensible pole-type semi-trailer for hauling round timber, with an automatic coupling by which a tractor can be attached to a trailer at any angle up to 90° (Scammel Lorries Ltd., Watford, England); a loader crane, mounted on a Case 'LA1' industrial tractor, designed to speed up operations in moving pulpwood in the storage yard (Harrison Manufacturing Co., Columbia, S.C., U.S.A.).

466. **(1) Forestry and logging equipment. (2) Equipment demonstrated at Oxford.** *Wood* 20 (8), 1955 (331–3).

Two articles covering descriptions or demonstrations of logging units and tractors with their accessories and other tools. Included are the Fordson Major (crane, heavy-duty winch, timber arch), the Whitlock Dycan ditcher, Unipower 4-wheel drive tractor, Fulgora sawdust burner, TelesSmith Crosscut, County Crawler tractor and Massey-Harris-Ferguson equipment.

31. Logging and Transport: General

467. FUGLESANG, F. R. **Ramin production in Sarawak.** *Timb. Tr. J.* Ann. spec. issue, 1955 (50–1).

Describes the operations of the Colonial Timber Co. Ltd., on the Rijang River, including diesel-operated tramways on a floating log base, rafting, milling (quarter-cutting to obviate end splitting), bluestain prevention, drying, and loading on to ocean-going ships.

468. DECAMPS, A. Les exploitations de Teck au Siam. **[Teak logging in Siam.]** *Bois For. Trop.* No. 42, 1955 (26–36). [F.e.span.]

Describes the use of girdling, felling methods, the employment of elephants for skidding logs to the launching place, and the process of floating and rafting to the mills. The advantages of employing elephants rather than tractors are emphasized.

469. JINDRA, J., and ZÁPOTOCKÝ, B. Nové formy organisace těžby dřeva. **[New forms of organization in logging.]** *Lesn. Knihovna* (*malá Řada*) No. 52, 1954. pp. 99 + [2]. 26 refs. [Cz.] Price *Kčs.*11·50.

Describes the principles of logging operations, new forms of skidding and transport, and flow-line logging in the U.S.S.R. and Czechoslovakia.

32. Felling and Related Operations

322. Felling Season. Preparatory Measures

470. NENZELL, G. Risken för lagringsskador vid sommarhuggning av sågtimmer. **[The risk of storage damage when sawtimber is felled in summer.]** *Norrlands SkogsvFörb. Tidskr.* 1955 (2), (249–74). 10 refs. [Sw.]

An examination was made, in central Norrland, of Norway Spruce and Scots Pine logs felled at monthly intervals from May to September, patch barked, completely barked (a few only for comparison) or left unbarked, and left stacked either in the forest or in the open by the roadside until October. Results are shown in graphs. Only the logs felled in May and June showed damage by insects and by bluestain carried by insects; timber felled in May showed greater damage, and damage was greater in patch-barked than in unbarked logs. Bluestain spreading from areas of bark damage and from the end face of the logs was extensive in timber felled from May to July, was less in those felled in August and was absent from those felled in September. The spread of the fungus into the sapwood was closely connected with the size of the bark-free area. Butts were more liable to bluestain than tops. Patch-barked timber showed more damage by rot fungi than unbarked. Patch-barked Pine showed more damage from bluestain and rot than Spruce. Test sawings resulted in greater loss in value in unbarked timber felled in May–July and stored in the open than in that stored in the forest. The loss in value for timber felled in May–August shows that summer felling of sawtimber in the area should not take place before September. Some comparative figures for costs are given.

323. Felling and Subsequent Primary Conversion

See Nos. 473–9.

33. Degree of Utilization and Waste. Clearing the Felling Site. Harvesting of Small Wood

See also No. 528.

471. BUNTING, A. H., MCBRIDE, J., and GUNN, R. H. **A review of methods of land clearing.** *J. Sci. Food Agric.* 6 (3), 1955 (121–32). 12 refs. O.R.S.

Describes methods of clearing land for primitive and mechanized farming, and includes tabulated data on costs, based largely on experience from the Tanganyika groundnut scheme since 1937.

472. ROCHE, W. J. **A timber rake attachment for a bulldozer blade.** *Queensland Agricultural Journal, Brisbane* 80 (5), 1955 (270–3). O.R.E.

The attachment, 18 ft. wide with steel tines 4 in. apart, is fitted with two sets of twin shoes adjusted to carry the tine points just clear of ground level, making possible the collection of slash and debris with minimum disturbance to the soil.

34. Storage in the Forest and at Log Dumps

See Nos. 470, 948, 965.

35. Performance Measurements for Determining Piece Rates in Felling and Related Operations

473. LUNDGREN, N., SUNDBERG, U., and LINDHOLM, A. En undersökning av arbetstyngden vid användning av motorsågor i skogen. **[An investigation on the heaviness of work involved in using power saws in the forest.]** *Medd. SkogsforsknInst., Stockh.* 45 (10), 1955. pp. 46. 10 refs. [Sw.sw.e.] Price *Kr.*2.

Measurements were made of oxygen consumption during walking at different speeds on different types of ground and snow condition, carrying saws weighing 11·0, 15·8 and 19·5 kg. respectively, and during sawing with these saws. The heaviness of the work was closely related to the nature of the snow cover and to the weight of the saw. Saw weight was less important in sawing, which proved to be comparatively light work.

36. Tools, Machines and Equipment for Felling and Related Operations

See also Nos. 465, 472, 528, 858–9.

474. ZIEGER, E., and SACHSSE, H. Messung des Schälwiderstandes. **[Measuring barking resistance.]** *Holz-Zbl.* 81 (112), 1955 (1323–4). 9 refs. [G.]

After discussing the physiological problems of bark loosening and their practical importance, the authors describe the resistance meters developed by Zieger and by Wilcox [see *For. Abstr.* 16 (Nos. 522–3)], their uses, and drawbacks, particularly of the latter, which is inapplicable to small sizes and to measuring resistance in one direction. Measurements with these two types of instrument are not comparable. One use of barking-resistance meters is in the selection of suitable trap trees; the optimum for Spruce, against *Ips typographus*, is given as 200–800 g.

475. **De-barker power feed.** *Timb. Tr. J.* 214 (4121), 1955 (103).

Cundeys Ltd., Alfreton, Derbyshire, have patented a power-feed roller for their standard mobile barker, said to increase production by ca. 50% over a fixed-table type, and greatly to reduce manual effort. The log, kept constantly rotating and advancing, is automatically held up to the cutting disc, the feed rate being variable by touch control and easily overridden to deal with knots etc. A clutch is incorporated to protect the roller when obstructed. One-man handling over good ground is possible for this machine, which requires no jacking.

476. **[McCulloch Super 33 chain saw.]** *Timb. Tr. J.* 214 (4121), 1955 (104).

This new model (McCulloch Motors Corporation, San Francisco) has a greater h.p., chain speed and compression ratio than the 33 model, with improved design in piston, cylinder porting, silencer, sawdust dispersion, and bearings, and better access to primer and carburettor, with an improved seal for the former.

477. JANČO, JANDEL', and JÁNSKÝ. Jednomužné motorové píly v t'ažbe dreva. **[One-man power saws in logging.]** *Lesn. Práce* 34 (5), 1955 (220–32). [Slovak.]

Illustrated description of the following logging saws powered by internal-combustion motor: (1) the Czechoslovak JMP-54, MP-50, Orava and Pionier, (2) the Soviet CNIIME, CNIIME-Kb2, Družba, Krasnyĭ Ural and Zvezda, and (3) the Swedish Comet. Efficiency and other characteristics are tabulated and graphed.

478. GLÄSER, H. Stand und Aussichten der Motorsägenverwendung beim Holzeinschlag. **[The use of power saws in logging: present position and prospects.]** *Holz-Zbl.* 81 (109), 1955 (1287–90). 14 refs. [G.]

A survey of existing models (particularly one-man chain saws and their tooth shapes) and their efficiency, technical and economic, under German conditions.

479. JOSHI, D. P. **Control of direction of felling.** *Indian For.* 81 (6), 1955 (379–83 + 2 photos + 2 dgms.).

Briefly describes methods employed in Uttar Pradesh and describes in some detail the use of the Simplex stem-press for preventing splitting [cf. *For. Abstr.* 15 (No. 2561)] and the Seilzug Greif, a hand-operated cable-tensioning device for controlling the direction of fall of trees. Both machines have been developed at Solothurn, Switzerland.

37. Transport

372/377. Land Transport

See also Nos. 465–9, 858.

480. **Summaries of '*Informasjon*'.** Skogbruketsog Skogindustrienes Forskningsforening (Transportutvalget), Vollebekk.

Short English summaries of *Inform. Skogbr. Skogind. ForsknForen.* (*Transportutv.*) Nos. 1–4, 6–23, 32–48. [See *For. Abstr.* 15 (Nos. 2579, 2581–2); 16 (Nos. 524, 535, 542–5, 549, 555–6, 564).]

481. LÜNZMANN, K. Ein Überblick über die Holzbringung in den Tropen. **[Timber extraction in the tropics.]** *Z. Weltforstwirt.* 18 (1), 1955 (16–23). 108 refs. [G.e.f.]

A survey with particular reference to mechanized transport and road-building, based chiefly on West African and Philippine experience. The use of helicopters and of seagoing rafts is also touched upon.

482. BROWN, G. S. **Timber extraction methods in N. Borneo.** *Malay. Forester* 18 (3), 1955 (121–32 + 16 photos).

Methods of extraction practised in North Borneo since 1946 are compared and contrasted, considering aspects of efficiency, labour requirement, and relationship to silvicultural management, but mainly considering the reasons for and results of the general tendency to replacement of manual skidways (*kuda-kuda*) by tractors. The introduction of road-making by timber companies and the use of wheeled vehicles is discussed and explained by the increasing scarcity of flatland forest areas, and the factors influencing a choice between rail and road for main extraction lines are considered. *Author's summary.*

483. HERRICK, D. E. **Tractive effort required to skid hardwood logs.** *For. Prod. J.* 5 (4), 1955 (250–5).

It was found that the tractive effort was affected by the skidding method, while the size and number of logs included in a load had no significant effect on the resistance to skidding. On level ground, sulky skidding required less effort than ground skidding for loads > 500 lb. This advantage increased with downhill, but decreased with uphill, skidding.

484. BIGGAR, J. C., and CHARLESWORTH, W. J. **Bundle yarding of eight-foot pulpwood on the limits of the KVP Company Limited.** *Pulp Paper Mag. Can.* 56 (7), 1955 (150 . . . 164). (*Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1474 (*B*-8-*g*).)

In suitable terrain and stand composition, the method is cheaper than horse logging, and eliminates the use of sledges and strip roads. Logging all the year round is possible. It may prove helpful to natural regeneration. Changes in equipment and yarding pattern to reduce non-profitable time are indicated. Costs per cord are graphed against strip lengths at 3 costing levels and for yields of 20–35 cords/acre. [Cf. *For. Abstr.* 16 (No. 4143).]

485. CAROTHERS, J. E., and GARIN, G. I. **Log loading at reduced costs.** *Sth. Lumberm.* 191 (2386), 1955 (54).

Describes the Taylor side-post loader, consisting of a strong upright post carrying a pulley, which can swing round 350° and is welded to a heavy beam fixed across the lorry axle. A cable connected via the pulley with a winch of 6000 lb. capacity powered from the lorry, can pull in logs ca. 50 feet away. The cable and winch also serve to secure the load.

486. KATO, S., and HORI, T. **[How to estimate the tension of skyline cables with multiple concentrated loads: (1) The general solution.]** *J. Jap. For. Soc.* 36 (11), 1954 (339–43). 1 ref. [Jap.e.]

A new maximum-tension formula is first developed, on the basis of which another is developed for two equal concentrated loads, and this is compared with a semi-empirical formula based on experiments with models. The merits of all these are compared with the standard formula for uniform loads.

487. SCHLAGHAMERSKÝ, A. **Mechanical harvesting by the Forestry Faculty at Brno.** *Transl. For. Prod. Lab., Can.* No. 86, 1955. pp. 5. Transl. from *Lesn. Práce* 33 (8), 1954 (374–81). Limited distribution.

Hauling on slopes, by means of equipment consisting of a double-drum windlass, cables and pulleys.

488. HYLER, J. E. **Hauling logs and lumber.** *Sth. Lumberm.* 191 (2385), 1955 (64–8).

A general survey, chiefly concerned with the design of tractors, lorries, and trailers, their uses and performance, along with a table comparing, for vehicles of various weights and pay-loads, average running costs and costs per ton mile.

489. **Directory of wheel and track-type tractors produced throughout the world.** FAO, Rome. 1955. pp. 371. [E.F.Span.]

The information contained in the directory has been obtained from the manufacturers or from official publications. All information is given in English, French and Spanish, and specifications are given in both metric and English systems.

490. Schlepper auf der 43. Wanderausstellung der DLG in München, forst- und holzwirtschaftlich gesehen. **[Tractors in the 43rd travelling exhibition of the DLG [German Agricultural Society?] in Munich, from the point of view of forestry and the timber trade.]** *Holz-Zbl.* 81 (75), 1955 (901–2). [G].

Illustrated descriptions of several German tractor types.

491. **Tractor design and development.** *Pulp Paper Mag. Can.* 56 (8), 1955 (126 . . . 150). (*Woodl. Sect. Index Canad. Pulp. Pap. Ass.* No. 1470 (*B*-8-*f*).)

The order of frequency of complaint by users of crawlers of > 30 h.p., products of Allis Chalmers, Caterpillar, International Harvester and Oliva, referred to track frame, tracks, track rollers, idlers, engine cooling, final drive, steering clutches, mould board, brakes, sprockets, transmission, C frame, fuel system, main frame, main spring, guards, hydraulic system. The panel discussion with representatives of these firms is reported.

492. EISENHAUER, G. Erhöhung der Schlepperzugkraft durch Wasserfüllung der Triebräder. **[Increasing tractor power by filling the driving wheels with water.]** *Holz-Zbl.* 81 (96), 1955 (1144). 1 ref. [G.]

Describes and illustrates the use of an auxiliary by-pass valve, the 'Hannover Maus', which, in conjunction with the standard 2-part tyre valve, allows the inner tube to be filled with, and emptied of water. In medium-heavy tractors, the increased weight is 200–300 kg., i.e. some 20% of their average operative weight, and in heavy ones, up to 500 kg.; when an anti-freeze mixture is used, as is imperative in winter, the respective figures become 300–400 and 700 kg. The mixture recommended is

crystalline $CaCl_2.6H_2O$ or $MgCl_2.H_2O$ (55 kg./100 litres). Detailed instructions for the use of the combination valve are given.

493. **A heavy duty lorry.** *Wood* 20 (9), 1955 (377–8).

Scammell Lorries Ltd. Watford, have designed the 6 × 6 'Constructor' lorry, fitted with a Rolls Royce 180-h.p., 6-cylinder diesel engine for transporting a 30-ton load of round timber 'off the highway', which is operating successfully in Tanganyika and British Guiana. Transmission is through a 6-speed gearbox with a transposing box giving 12 forward speeds to the 3 independently operated double-reduction epicyclic axles. The all-steel cab is heat insulated and has an electric fan. Wheel-base lengths of 21 ft. 9 in., 17 ft. 8 in., and 15 ft. 9 in. are available, the last here illustrated with a hook-on pole trailer and a winch with a line pull of 50,000 lb.

378. Water Transport

See also Nos. 467–8.

494. MÜLLER, K. Untersuchungen über den Einfluss der Flösserei auf den Fischbestand und die Fischnahrung. **[Investigations on the effect of floating on the fish population and fish food.]** *Årsb. Finl. Flottaréfören.* No. 23, 1954 (1955), (32–85). 14 refs. [G.fi.]

An account of research in Sweden on the effect on fish of damming, cleaning the channels by tractor, the presence of bark in rivers and lakes, and the use of growth regulators on bank vegetation. [Cf. *For. Abstr.* 13 (Nos. 3921–2).]

495. ARO, P., and TURJA, M. Uittohäviöön vaikuttavista tekijöistä. **[Factors affecting floating losses.]** *Årsb. Finl. Flottaréfören.* No. 23, 1954 (1955), (158–86). 3 pp. of refs. [Fi.e.]

In Finland, during the period 1928–50, the proportion of wood stacked before floating increased and, as stacked wood is less buoyant, there was a corresponding increase in floating losses. The annual loss is at least 261,100 solid cu.m. pulpwood, and 131,300 cu.m. logs. A literature survey has been made, mainly of Scandinavian and Finnish literature; results are discussed, and workers on different aspects of the subject are listed. There is an extensive bibliography.

496. HYYPPÄ, O. Kokemuksia uittoväyläperkauksista traktoreilla sekä betonipatojen rakentamisesta talvityönä. **[Clearing floating channels [by tractor] and constructing concrete splash dams in winter.]** *Årsb. Finl. Flottaréfören.* No. 23, 1954 (1955), (86–97). [Fi.e.]

497. EKLUND, R. Päijänteen, Ääne-Haapakosken, Keiteleen ja Rautalammin väylien rakentaminen yhtenäiseksi nippukuljetusverkoksi. **[The construction of the Päijänne, Ääne-Haapakoski, Keitele and Rautalampi floating system for continuous bundle transport.]** *Årsb. Finl. Flottaréfören.* No. 23, 1954 (1955), (98–135). 13 refs. [Fi.e.]

The advantages of bundle-floating over loose floating are discussed, and the plans for conversion illustrated by diagrams. [Cf. *For. Abstr.* 15 (No. 3657).]

38. Forest Engineering

383. Roads and Bridges

See also No. 481.

498. WORLEY, D. P., and SCHMIDT, O. A. **Cost and design of simple forest road drainage structures.** *Res. Pap. Pa. St. For. Sch.* No. 23, 1955. pp. 5.

Gives materials, costs, and plans, for 3 types of culvert and a 'corduroy dip'.

385. Drainage, Irrigation, Sedimentation. Water Supply

See also No. 466.

499. ALBJAKOV, M. P., and ELPATJEVSKIĬ, M. P. Lesnoĭ kanavokopatelj. **[The [LK-2] forest ditching machine.]** *Lesn. Hoz.* 5 (10), 1952 (66–9). [Russ.]

Trials with the improved LK-2 model carried out in the Siversk leskhoz on clayey soils having a 10- to 40-cm. layer of peat, and ground cover of *Polytrichum*, *Polytrichum/Sphagnum* or *Polytrichum/Vaccinium*, demonstrated that when driven by two tractors it could dig a trapezoid-shaped ditch 0·3 m. wide at the bottom and 55–70 cm. deep at one traverse, and this could be deepened to 65–80 cm. at a second. The machine showed itself capable of dealing with slash, roots up to 15 cm. thick, fresh stumps up to 18 cm., and 10-year-old ones up to 30 cm. diam., stones weighing as much as 2 tons, and underwood up to 6 m. high. The possibility of winching it between two stationary tractors enables ditches to be made in waterlogged ground impassable by tractor. Its capacity per 8-hour shift is (*a*) for new ditches, 5·4 km., dropping to 3·5 km. when the going is heavy, and (*b*) for repairing existing ditches 5·7 and 4·0 km. respectively.

499a. **Forest drainage in Finland.** *Timb. Tr. J.* 214 (4123), 1955 (97).

Describes the work done by the Kesko plough, f.o.b. Finland £1470, in combination with Series 5 Broughton Winches fitted to Allis Chalmers A9 diesel crawlers. Plough, tractor, winch, and drainage ditches are illustrated.

500. AUTIO, K. Koneellinen metsäojitus talviolosuhteissa. **[Mechanical digging of ditches for forestry purposes in winter.]** *Metsät. Aikak.* 1955 (5), (163–4, 156). [Fi.e.]

Results of work last winter showed that mechanical ditch diggers could be used even after the ground had started to freeze. In frozen swamps, results were better than in summer. Snow to nearly 1 m. deep did not prevent the work. *From author's summary.*

4. FOREST INJURIES AND PROTECTION

See also No. 668.

501. MILEVIĆ, K. S. Zdravstveno stanje šuma u N R Srbiji. [**The state of health of the forests of Serbia.**] *Zašt. Bilja* No. 22, 1954 (70–87). [Croat.e.] I.M.I.

A review in lecture form of the position of forest protection, including tables summarizing losses in timber and money, for the period 1945–51, caused by man, livestock, barkbeetles, other insects, diseases, and other injuries. Emphasizes the need for prevention rather than cure and for the education of experts in forest protection.

41. General Technique of Forest Protection. Types of Injury

414. Chemical Control

502. VOIGT, G. K. **The effect of applied fungicides, herbicides and insecticides on the content of nutrient elements in tissue of coniferous seedlings.** *Proc. Soil Sci. Soc. Amer.* 19 (2), 1955 (237–9). 5 refs. O.R.E.

Pinus banksiana and *P. radiata* were raised in nursery seedbeds and greenhouse pot cultures on soils treated with biocides used singly and in various combinations at different rates of application, among them $Al_2(SO_4)_3$ Hg_2Cl_2, formaldehyde, Thiosan, allyl alcohol, Stoddard oil, BHC, and chlordane. Responses ranged from a stimulation of growth and increase in the tested nutrient contents (N, P, K, C and Mg) to a severe depression of growth rates and reduction in nutrient content. [Tissue analysis may help to determine the effect of biocides on the availability of nutrient elements to tree seedlings.] *From author's summary.* [Cf. *For. Abstr.* 16 (Nos. 1857, 4166).]

503. POTTS, S. F. **A dual-nozzle system for mist blowers.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 48, 1955. pp. 2.

The system allows the lower accessible parts of trees to be treated with a fine spray and the upper parts of tall trees with a coarse one giving drops 60–80 μ in diam., and has almost doubled the quantity of chemical deposited at the top.

416. Types of Injury

See No. 588.

42. Injuries from Inorganic Agencies other than Fire

See also Nos. 554, 675.

421. Air Currents

See also No. 641.

504. EVANS, J. D. D. **Air movements and their effects on forestry.** *Quart. J. For.* 49 (4), 1955 (251–9).

Discusses the effects of air movement (or lack of movement) on forests and their management, with reference to frost pockets, snow breakage, windthrow etc. and their repercussions on drainage, thinning, and location of felling areas.

505. TROUSDELL, K. B. **Hurricane damage to Loblolly Pine on Bigwood Experimental Forest.** *Sth. Lumberm.* 191 (2383), 1955 (35–7).

Gives rather more detail on damage already reported [see *For. Abstr.* 16 (No. 4172)], showing the effect of stand condition (age, previous use of site, degree and form of felling) on damage, and the effect of fractures on sawtimber recovery.

422. Temperature Influences. Frost. Heat. Drought

See also Nos. 216–7, 236, 399, 504.

506. SCHUBERT, G. H. **Freezing injury to Sugar Pine cones.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 96, 1955. pp. 2.

An examination of small cones on the Stanislaus Experimental Forest in August 1954 suggested that they had been killed by an unusually severe frost on 2 June. This is the first report of frozen cones in the area.

507. POSKIN, A., and FLON, P. Contribution à l'étude de la gélivure des peupliers euraméricains en Belgique. [**Frost-crack of hybrid Black Poplars in Belgium.**] *Spec. Rep. 8th Sess. int. Poplar Comm., Madrid 1954*, No. *FAO/CIP/75-D Add.* 1, 1955 (3–51). 23 refs. [F.f.]

Preliminary report by a committee appointed to investigate the causes of frost-crack of Poplar, which results in considerable damage to Belgian plantations of hybrid Black Poplars. The following tentative conclusions have been reached: (1) Exceptionally severe winters are not an indispensable factor in producing this type of injury, the prime cause being sudden and wide variation of temperature during prolonged periods of relatively severe cold. The data collected (tabulated) indicate that such variation is much greater at ground level and up to 10 cm. above it than at breast height, for which microclimatic data are usually given. (2) Solar radiation, though it often occurs at the time of injury, seems not to be a necessary factor, though it may exercise an indirect influence by accentuating temperature variations. (3) The mechanism of frost-crack formation is supposed to be due to unequal changes of temperature within the stem of medium-sized trees, caused by changes in air temperature. These in turn give rise to irregular shrinkage and tangential tensions which, in certain conditions, provoke its rupture. Small trees are less subject to frost-crack, because temperature-changes occur fairly rapidly throughout, and large trees because the central mass of wood is relatively immune to temperature change and counterbalances the effect of tensions occurring in the outer layers. (4) Soil conditions and spacing are contributory factors, over-close spacing being particularly favourable to the occurrence of frost-crack. (5) × *Populus regenerata*, × *P. robusta* and × *P. serotina* are susceptible to frost-crack in unfavourable ecological

and silvicultural conditions; there are some indications that × *P. marilandica* and *P. virginiana* may be more resistant.

508. PECROT, A. Différentes relations entre l'apparition de la gélivure chez le peuplier euraméricain et les principaux caractères morphologiques du sol en Belgique. **[Relations between the occurrence of frost-crack in hybrid Black Poplars and the principal physical characters of the soil in Belgium.]** *Spec. Pap. 8th Sess. int. Poplar Comm., Madrid 1954*, No. *FAO/CIP/75-D Add.* 1, 1955 (67–83). Also in *Bull. Inst. agron. Gembloux* 23(3), 1955(301–16). [F.]

A study was made in some 30 Poplar plantations in different parts of Belgium and the data are shown graphically. The factors investigated were rooting depth, water-table, pH, internal drainage, soil texture and soil structure. It was found that a high incidence of frost-crack was associated with the following conditions: (1) the presence of an impermeable pan, a thick layer of acid peat near the surface, or a permanent water-table; (2) an irregular soil-water régime (plateau soils with a temporary water-table are particularly to be avoided); (3) very acid soil pH; very slow or very rapid internal drainage; (4) defective soil structure with consequent slow permeability and lack of aeration; (5) the presence in the soil of a high % of stones or gravel; (6) sandy soils, unless they are specially rich in humus, neutral or slightly acid in reaction, and with a high, permanent water-table; (7) loess soils with a deep water-table, on which Poplar requires a pH of at least 6: with pH of 4–5 frost-crack is often very frequent on these soils. Frost-crack was found to be absent or rare on (*a*) alluvial soils of good structure, alkaline or very slightly acid, with a permanent water-table at a depth of ca. 60 cm. (Soils of this kind can be temporarily flooded in winter without apparent injury to the Poplar); (*b*) recent colluvial soils of secondary valleys, neutral or alkaline in reaction and always moist; (*c*) in general, on deep moist soils of neutral or only slightly acid reaction.

509. LUČNIK, Z. I. O zimostoïkosti duba letnego na Altae. **[The frost-hardiness of *Quercus robur* in the Altai Region.]** *Lesn. Hoz.* 5 (11), 1952 (74–7). [Russ.]

Quercus robur was introduced by settlers into the Altai region, and trees 30–50 years old are found in some towns. Data for a few open-grown trees near Barnaul, on chernozems of low fertility, show a growth rate corresponding to that of quality classes III–IV in Russia proper, though trees in stands might be expected to do better. Natural regeneration occurs, but the life of the species may be short here, some trees having died at 40–55 years. Detailed examination of cross-sections of two dead, and of one outwardly sound, tree showed that all suffered from frost cracks and that during the last 13 winters their annual shoots had been damaged 6–7 times by frost, remaining undamaged only in relatively mild winters with temperatures ⩽ − 40° C. Examination of the older wood showed that the tissues had been injured to a depth of 3–7 annual rings, but in all cases the cambium had survived, producing a protective cork layer and then laying down normal rings; the injured tissues were clearly distinguishable by their light colour and signs of fungal decay. The worst injuries to the wood occurred during the particularly hard winters of 1918–19, 1938–39 and 1950–51 when temperatures dropped respectively to − 47·9, − 49·9 and − 47·2°. In mature trees damage to wood tissues was not correlated with the sum of temperatures below 0°, the effective factor being the occurrence of low minima. In 1944–45 the absolute minimum was only − 42·6 and only young Oak suffered, but in 1942–43, with a minimum of − 49·9°, severe damage to the wood tissues of some of the largest trees was recorded. During 1950–51, frost damage to sapwood was particularly serious, causing blockage of the water-conducting vessels, a condition aggravated by a dry spring and the absence of moisture reserve accumulated in the soil during the autumn; this killed the weaker trees and, in the rest, the 1951 annual ring was the narrowest of their 43–55 years' life. It is suggested that acorns from the survivors should be used for attempts to produce frost-hardy strains. There should be no difficulty in raising the large numbers of plants required for selective breeding, as the acorns are sound and of high germination capacity (in 1951, 160 kg. of acorns yielded 30,000 seedlings). There is also the possibility of crossing *Q. robur* with the frost-hardy *Q. mongolica*.

510. KOSTKA, K. Účinná ochrana lesních kultur a porostů. **[Efficient protection of forest plantations and stands.]** *Lesn. Práce* 34 (3), 1955 (138–9). [Cz.]

Recommends covering the terminal shoot with a thin-walled glass test-tube 5–7 cm. long and of appropriate diameter (or with a cellophane bag) to protect the shoot against late and early frosts and against insects. Costs: Kčs. 10/100 tubes.

511. ŘEHŮŘEK, S., and BOUČEK, B. Dýmovničky. **[Smoke generators.]** *Lesn. Práce* 34 (3), 1955 (140–1). [Cz.]

Describes the method of protecting nurseries against late frosts by generating a smoke layer above ground. A simple generator consists of a cylindrical tin container with perforated lid, filled with sawdust, impregnated with oil and coal tar.

512. TRNKA, J. Proti pozdním jarním mrazům. **[Against late frosts.]** *Lesn. Práce* 34 (5), 1955 (232–4). [Cz.]

Describes an automatic smoke-generating apparatus in which a thermostatic device closes an electric circuit at a pre-set temperature, thus actuating an igniter of the smoke charge.

513. BRENDER, E. V. **Drought damage to Pines.** *For. Fmr.* 14 (10), 1955 (7, 15).

There was considerable damage by drought in August–October 1954 to *Pinus taeda*. Mortality was found to be confined to shallow soils with an effective depth of < 20 in. and to be most severe on soils with < 16 in. of poorly developed soil over impervious parent material. On these sites entire stands up to 15 years of age succumbed. On sites with an effective depth of 16–20 in. of poorly

developed material on loose friable parent material, mortality was confined to younger and smaller trees. On soils with a more nearly normal profile and A, B and C horizons, but with an effective depth of < 20 in., large numbers of seedlings up to 6 years of age died.

423. Precipitations

See also No. 504.

514. MRÁČEK, Z., and CHYBA, J. Probírky v oblastech ohrožovaných jinovatkou, námrazou a sněhem. **[Thinning in regions menaced by rime, glazed ice and snow.]** *Lesn. Práce* 34 (1), 1955 (13–20). [Cz.]

Presents, in the form of tables and frequency polygons, the results of a survey on the extent of breakage due to snow and glazed ice, which occurred in 1952–53 in the Jimramov forest range near Polička in Moravia. The observations covered a total area of 586 ha. carrying 2nd or 3rd generations of pure Norway Spruce stands introduced in place of the original mixed Beech stands. Over ½ of the area a total of 1875 cu.m. was affected by breakage. Age classes II, III and IV were the most affected, with regard to both area and tree volume. Stems with the following characteristics were the most frequently broken: (1) a short crown on a high stem; (2) excessive slenderness; (3) excessive crown development; (4) insufficient crown development. These features were common in neglected stands where the thinning, if any, was done from below. In such stands intensive thinning from above cannot be recommended, because they would then be exposed for a long time to risk of breakage; only stands that have been tended from the start can be thinned from above. In a 52-year Spruce stand, of Schwappach site class 4, area 3·04 ha., with scattered Larch, Pine, Douglas Fir and Alder, the greatest damage was found in the 10-cm. d.b.h. class, and by far the most frequent damage was breakage in the upper part of the stem. Only suppressed stems were broken, overgrown and dominant stems being hardly affected, probably because of a moderate thinning from above in 1951. Larch and Douglas Fir were hardly damaged, Pine and, in particular, Alder greatly so. In another stand (60 years, pure Spruce) where thinnings had been badly neglected, the breakage was ca. 20% by volume.

The following measures are recommended for protecting Spruce stands against breakage: (1) thinning from a very early age; (2) introduction of glaze-resistant types, with priority for Spruce of mountain origin; (3) moderate, frequent thinning from above; (4) thinning from below (more intense); (5) retention of only a few of the best developed suppressed trees; (6) thinning to be done early in spring.

515. VELIČKOVIĆ, D. Snegolomi u šumama na Goču. **[Snow breakage in the forests of Mt. Goč.]** *Šumarstvo* 7 (1/2), 1955 (41–50). [Serb.f.e.]

Describes in detail the causes and extent of breakage during the heavy snowfall of 9 Oct., 1953, on trees carrying foliage (Beech, Silver Fir, *Pinus nigra*). None of the uprooted trees had any taproot.

424. Soil Conditions. Erosion Effects. Nutrient Deficiencies etc.

See also Nos. 218, 343.

516. SCHÜTTE, K. H. **A survey of plant minor-element deficiencies in Africa.** *Sols Africains, Paris* 3 (2), 1955 (282–97). 21 refs. [E.F.]

Includes a map and table showing the distribution of trace-element deficiencies observed in Africa south of the Sahara, and indicating research in progress. In the light of this survey it seems that ordinary NPK fertilizer trials are inadequate for most African conditions and should be carried out in conjunction with trace-element trials.

517. LAFOND, A. Les déficiences en potassium et magnésium des plantations de *Pinus strobus, Pinus resinosa* et *Picea glauca* de la province de Québec. **[K and Mg deficiencies in plantations of *Pinus strobus*, *P. resinosa* and *Picea glauca* in Quebec.]** *C.R. 34e Assembl. ann. Ass. Ingén. for. Québec* 1954 (65–82). 20 refs. [F.]

A number of plantations suffering from various degrees of chlorosis and dieback were examined, foliage analysed etc. The affected plantations occurred on old fields with sandy soils and a low water-table, where the pioneer vegetation was a *Polytrichum* type of *Betula populifolia* association. Investigation traced the condition to K and Mg deficiency.

425. Chemical Influences (Atmospheric)

518. GÜDE, J. Die Feststellung der durch Steinkohlenrauch verursachten Zuwachsminderung in Fichtenbeständen. **[Ascertaining the loss of increment in Spruce stands due to coal smoke.]** *Z. Weltforstwirt.* 17 (3), 1954 (87–93). 12 refs. [G.e.f.]

To ascertain the extent to which increment is reduced by coal-smoke poisoning, increment borings were taken from dominant trees in the Breitenau valley (Styria), exposed to smoke from a single magnesite factory whose production has fluctuated considerably over the last 30 years. Basal-area/age growth curves derived from these showed marked bends coinciding with periods of increased works activity, but no signs of recovery when production declined. They appear to settle into the pattern of a lower quality class, thus enabling past damage to be calculated on the basis of the difference between the m.a.i. of the respective classes. For current loss of increment, the method suggested is based on the proportion of m.a.i. accruing on the dominant stems by means of b.a. frequency distribution curves. For both methods, careful subdivision into small units may be necessary, as the degree of damage varies widely according to prevailing wind, terrain etc. in additiont to distance from the source of pollution.

43. Forest Fires

431. Predisposing Factors and Causes. Fire Danger. Fire Behaviour

519. HARDY, C. E., SYVERSON, C. E., and DIETERICH, J. H. **Fire weather and fire danger station handbook.** *Misc. Publ. Intermt. For. Range Exp. Sta.* No. 3, 1955. pp. vii + 83.

A fully illustrated handbook, containing sections on: the fire-danger station (location, lay-out and equipment); fire-weather observations (methods and equipment); and fire-weather instruments, their care and repair.

432. Prevention and Control

See also Nos. 742, 1111.

520. WORRELL, A. C. **Economics of fire detection in the South.** *J. For.* 53 (9), 1955 (639–44).

A discussion based on fire-occurrence data (% days, % fires, mean daily wild fires and controlled burns, all per danger class; and diurnal frequency distribution of number of fires) from a 14-county district in S.E. Georgia. Graphs and tables show the % of fires visible to air patrol per hour flown through the day; % of fires to be seen from 1, 2, 3 . . . towers per 1000 sq. miles; required plane-hours to raise % of fires seen from 0 to 94; cost per 1000 sq. miles for tower and plane observation separately and combined; periods of the fire season (by day class and day period) in decreasing order of fire load, and total costs for coverage by combined tower and plane observation for coverages of 75, 80, 85, 90, 92, 94% of the fires with the marginal (extra) cost to raise each figure by 1%. Information is still lacking on the point where marginal cost just equals marginal benefit, the latter falling, the former rising, as coverage is increased.

521. **A fire hose dispensing tray for helicopters.** *E. D. Rep. U.S. For Serv.* No. 37, 1955. pp. 8.

522. **Know your fire pumps.** *Protect. Bull. B.C. For. Serv.* No. 3, 1955. pp. 5.

Notes on types of fire pump, hose, maintenance etc.

434. Revegetation etc. of Burnt Areas

See Nos. 394–5.

436. Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry

See also Nos. 291, 444.

523. WEAVER, H. **Fire as an enemy, friend and tool in forest management.** *J. For.* 53 (7), 1955 (499–504). 33 refs.

Wildfires, though enemies of good forest management, have held large areas under sub-climaxes of valuable species, e.g. the Southern Pines (particularly *P. palustris*), *P. monticola*, *P. strobus*, *P. ponderosa*, *Pseudotsuga taxifolia* and *Sequoia*. The author states the case for the continued use of fire in controlled burning, with data and illustrations and with N. American references to its application in regeneration, the maintenance of desired site conditions, thinning, and the reduction of fire hazard, number of fires, fire damage and cost of suppression. [Cf. *For. Abstr.* 15 (No. 377).]

524. MANN, W. F., JR., and WHITAKER, L. B. **Effects of prescribe-burning 4-year-old planted Slash Pine [*Pinus elliottii*].** *Fire Control Notes* 16 (3), 1955 (3–5).

In the winter of 1952–3 a prescribed fire was successfully used in a young *P. elliottii* plantation in Louisiana. Mortality was slight and height growth not seriously retarded. The main object of the burn was to reduce the depredations of free-ranging pigs, in which it was partially successful.

44. Damage by Harmful Plants. Virus Diseases

441. Weeds

See Nos. 317–8, 401.

Weeds: Chemical Control

See also Nos. 108–9, 290, 349–51, 417–9, 502.

525. LAURIE, M. V. **Weed problems and the potential value of herbicides and arboricides in forestry.** *Proc. Brit. Weed Control Conf.* 1953 (28–36). O.R.E.

Surveys problems encountered in nursery operations, afforestation of land not carrying shrub or tree growth, and rehabilitation of derelict woodlands and planting of scrub areas, and discusses the potentialities of herbicides and arboricides in dealing with them.

526. MAHLSTEDE, J. P. **Herbaceous weeds in woody crop plants and flowers including forest nurseries, ornamental nurseries, shelterbelts, and all others.** *Res. Rep. 11th. ann. Nth. Cent. Weed Control Conf.* 1954 (119–23). O.R.E.

Summarizes 7 papers from the Ohio, Wisconsin, and Iowa Agricultural Experiment Stations. Application of SES (Na 2,4-dichlorophenoxy sulphate) as a pre-emergence herbicide reduced weeds on mineral soils, but injury to species of *Ligustrum* and *Euonymus* resulted from July applications at 4 gal./acre. Na 2,4,5-trichlorophenoxyethyl sulphate gave highly effective weed control throughout the season and displayed excellent residual properties. Dalapon (2,2-dichloropropionic acid) was used effectively to kill grass among established 6-year-old Red Pine transplants, although some re-growth of grass and herbaceous weeds was noted. Combinations of TCA with CMU or Karmex DW (3-(3,4-dichlorophenyl)-1,1-dimethylurea) gave satisfactory weed control but caused injury to Red Pine seedlings. After several years of testing CIPC has won a definite place in the weed-control programme for nursery stock. Promising chemicals for use in forest and ornamental plantings are CMU, N.I.X. (Na isopropyl xanthate), and Karmex DW.

527. KUNTZ, J. E. **Control of herbaceous weeds in tree plantings.** *Res. Rep. 10th ann. Nth. Cent. Weed Control Conf.* 1953 (77–8). O.R.E.

Contains abstracts of the following papers: A weed control programme for a conifer nursery (*M. W. Day*); Chemical weed control in 2-year-old Poplar plantations (*J. E. Kuntz*); Prolonged effects of CMU on weeds and trees in forest plantations (*J. E. Kuntz*).

528. LARSON, R. E. **Mechanical considerations.** *Res. Rep. 11th ann. Nth. Cent. Weed Control Conf.* 1953 (150–7). O.R.E.

Includes abstracts of the following papers of interest to foresters: The portable wood-chipper used as a means of brush disposal for land clearing purposes (*L. O. Roth* and *J. C. Porterfield*); A heavy-duty stalk shredder used as a mechanical means of selective brush removal (*L. O. Roth* and *J. C. Porterfield*); A study of methods and equipment for chemical brush control (*R. L. Larson* and *J. D. Crumpacker*); Basal handgun treatment for brush control (*R. E. Larson* and *J. D. Crumpacker*); The use of the boomless nozzle for brush control (*J. D. Crumpacker* and *R. E. Larson*).

529. DAHMS, W. G., and JAMES, G. A. **Brush control on forest lands with emphasis on promising methods for the Pacific Northwest (a review of selected references).** *Res. Pap. Pacif. Nthwest. For. Range Exp. Sta.* No. 13, 1955. pp. 81. 239 refs.

Chemical and mechanical methods, control by prescribed burning, biological control, and combined methods. Tables include: chemical treatments for some Pacific Northwest brush species, and the effect on some Pacific Northwest conifers of chemicals applied as foliage sprays. References are mainly American.

530. MEYERS, W. A. **The effectiveness of Amizol on mixed brush.** *Abstr.* in *Res. Rep. 11th ann. Nth. Cent. Weed Control Conf.* 1954 (128). O.R.E.

Sprays of Amizol (3-amino 1,2,4-triazole), at rates of 6 and 12 lb. acid equivalent/100 gal. water in July, caused dieback and death of Poison Ivy, *Quercus velutina*, *Fraxinus americana* and *Carya tomentosa*.

531. MEYERS, W. A., BEATTY, R. H., and ALLEN, W. W. **Report on two years results of dormant basal sprays on mixed brush.** *Proc. 8th Ntheast. Weed Control Conf.* 1954 (453–8). 3 refs. O.R.E.

Sprays of varying concentrations of 2,4,5-T and oil/water ratio on species such as Oak and Red Maple (which coppice from the root collar) gave best kills with high rates of oil and high concentrations of 2,4,5-T. For root-suckering species the opposite was true, best effects resulting from lower concentrations of 2,4,5-T and a lower ratio of oil to water. *From authors' summary.*

532. BEATTY, R. H. **Control of brush on roadsides, utility lines and other rights of way.** *Res. Rep. 10th ann. Nth. Cent. Weed Control Conf.* 1953 (60–1). O.R.E.

Summarizes 3 papers by *T. K. Pavlychenko* and *A. J. Bestrop* on control of Buckbrush (*Symphoricarpos occidentalis*), Rose and Chokecherry (*Prunus melanocarpa*). In Buckbrush control, foliage sprays of 2,4-D and/or 2,4,5-T and of ACP 912 killed all stems to the ground. Regrowth was general, but delayed, and mostly abnormal, 2,4,5-T being the most effective in preventing it. In over-all dormant sprays the addition of TCA definitely increased the effect of the other chemicals. Response followed the same pattern as the foliage sprays. With Rose and Chokecherry response to foliage and dormant over-all treatment was the same as with Buckbrush, except that, with Rose, regrowth was more general after all treatments except 2,4,5-T, and with Chokecherry the 2,4-D treatments were least effective.

533. HANSEN, H. L. **Brush in forests, tree plantations, and farm woodlands.** *Res. Rep. 10th ann. Nth. Cent. Weed Control Conf.* 1953 (71–4). O.R.E.

A discussion of the problems involved, with abstracts of the following papers: 'First- and second-year responses of Scrub Oak to CMU' (*J. E. Kuntz*). 'Chemical control of Sweetfern' (*Comptonia peregrina*)' (*J. E. Kuntz* and *A. J. Riker*). 'Dormant basal treatments of large Poplars and Birch' (*T. K. Pavlychenko* and *A. J. Bestrop*):—*Populus tremuloides* and *Betula papyrifera* of 6–8 in. d.b.h. were sprayed up to 3 ft. above the ground with 1·5 and 3% concentrations of ethyl ester of 2,4-D (Weedone concentrate), a mixture of esters of 2,4-D and 2,4,5-T (BK64), a similar formulation with pentachlorophenol added (ACP 131), ester of 2,4,5-T (Weedone 2,4,5-T) and a mixture of acids of 2,4-D and 2,4,5-T (ACP 926) in (1) water and (2) fuel oil. Poplar was effectively controlled by all the chemicals and rates used in oil. Paper Birch was more resistant to all chemicals. In oil the most effective (BK 64 and Weedone concentrate) killed the foliage in the early stage of development, but had little effect on wood tissue. 'Dormant treatments of small Poplars with mixtures of systemic herbicides and TCA, 1952' (*T. K. Pavlychenko* and *A. J. Bestrop*):—Treatments tested were 1·5 and 3% concentrations of Weedone Concentrate, BK 64, ACP 131, Weedone 2,4,5-T and ACP 926, all sprayed at 40 gal./acre (1) in water, (2) in water in combination with TCA (ACP Grass killer) at a concentration of 1·2%, (3) in fuel oil, and (4) in fuel oil with TCA as above. Each individual treatment was applied (*a*) as an over-all top spray and (*b*) as a basal spray. Of series (1) Weedone and BK 64 were the most effective. Of series (3) all were effective. The advantages of adding TCA could not clearly be followed. 'Resprouting of Mountain Maple after basal spraying with 2,4,5-T' (*E. I. Roe*):—On the basis of the small-scale tests reported, *Acer spicatum* can be killed back and coppicing kept to a low level by basal spraying in late autumn with a 2–4% solution of 2,4,5-T in fuel oil.

534. HANSEN, H. L. **Control of woody plants in forests, tree plantations and farm woodlands.** *Res. Rep. 11th ann. Nth. Cent. Weed Control Conf.* 1953 (129–36). O.R.E.

A summary of recent work with abstracts of the following papers: 'Effects of season in Michigan on control of hardwoods, with frill girdles and 2,4,5-T' (*J. L. Arend*):—Frill girdling with 2,4,5-T esters in oil during summer and autumn gives better control of hardwoods, with less coppicing, than at other seasons of the year. 'Some effects of 2,4-D and 2,4,5-T ester foliage sprays on conifers' (*J. L. Arend*:—In tests of relative resistance of conifers it became evident that most conifers in Michigan can be treated in brush control and release operations during August with foliage sprays of 2,4-D and 2,4,5-T esters at rates of 2 lb. acid in 5 gal. water/acre without serious damage. 'Foliage sprays for Maple sprout clumps' (*M. W. Day*):—CMU applied in 1952 to the ground as water suspensions or as rapidly disintegrating pellets at 50, 100 and 200 lb./acre killed or severely injured most Oaks within

25 ft. of the treated area. Many of the severely injured trees and their coppice shoots died in 1953. Other coppice shoots died in 1954. 'Tests of MCP, 2,4-D and 2,4,5-T on Prickly Ash (*Xanthoxylum americanum*) in Minnesota' (*H. L. Hansen*). 'Use of aerial sprays to release conifers from Oak and Aspen competition' (*H. L. Hansen* and *E. J. Jankowski*). 'Basal and cut-surface applications of 2,4-D and 2,4,5-T on Box Elder, Red Oak and Cottonwood' (*H. L. Hansen* and *R. P. Leinfelder*):—Best results were obtained when trees were girdled, sprayed and left standing. 'Tolerance of conifers to various applications of 2,4-D and 2,4,5-T in Minnesota' (*R. P. Leinfelder* and *H. L. Hansen*):—The following conclusions were drawn from experimental sprayings. Little or no mortality occurs in White Spruce, Black Spruce, Balsam Fir, White Pine and Red Pine where applications of < 4 lb./acre of 2,4-D and 2,4,5-T are made after mid-July on well established trees. Jack Pine is the most sensitive of the conifers examined, rates of 2 lb./acre or more resulting in significant mortality. Several species show symptoms of spray effects such as needle yellowing (White Pine) defoliation and curling of current growth (Balsam Fir), and browning and dieback of current year's needles (Jack Pine), but within the indicated ranges 2,4-D and 2,4,5-T are safe to use to release established seedlings of the above-mentioned species. 'Controlling Scrub Oak with 2,4,5-T aerial sprays in Michigan' (*R. A. Ralston* and *L. L. Coulter*):—Tests showed that effective control of Scrub Oak in Michigan can be obtained without injury to suppressed Pine with aerial sprays of 1 lb. 2,4,5-T ester/acre in an oil/water emulsion applied at 2·5 gal./acre. 'Spraying Hazel with herbicides aids establishment and growth of Pine reproduction' (*E. I. Roe*):—Best results were obtained with 4 lb. of the NH_4 salt of 2,4-D in 40, 80 and 120 gal. water solution/acre applied in June. 'Herbicide spraying very effective in freeing Pines from overtopping brush' (*E. I. Roe*):—Good results were obtained in releasing natural Jack Pine seedlings and newly planted Red Pine from dense Large-tooth Aspen and brush by spraying with a 50/50 mixture of the isopropyl ester of 2,4-D and the propylene glycol butyl ether ester of 2,4,5-T in water solution at 1·84 lb./100 gal. or 0·65 lb./acre. Loss in Red Pine, however, amounted to ca. 15%. 'Aerial spraying to release planted Spruce from overtopping hardwoods' (*E. I. Roe*):—Promising results were obtained, particularly in the case of Paper Birch, with the propylene glycol butyl ether esters of 2,4-D at 1 lb. and 2 lb. acid/acre and with 2,4,5-T at 1 lb./acre respectively. All were applied in a 1–1–6 or a 2–1–5 herbicide/diesel oil/water emulsion at ca 2 gal./acre.

535. ELWELL, H. M. **Control of brush on rangeland and pastures.** *Res. Rep. 10th ann. Nth. Cent. Weed Control Conf.* 1953 (62–70). O.R.E.

Summarizes 13 papers by co-operators in Texas, Oklahoma, Nebraska, Minnesota and the Canadian Provinces of Manitoba and Saskatchewan. Aerial sprays of low-volatile 2,4,5-T ester were effective on Mesquite and on White Post, Blackjack and Dwarf Chinquapin Oaks. Blackjack was least susceptible to this herbicide. For Mesquite a single application using 0·66 lb. acid/acre was satisfactory. Good defoliation of Oak was obtained with 1 lb./acre followed by a similar treatment a year later. An emulsion of 4 parts water to 1 part diesel oil was as good a carrier as diesel oil alone. A higher % of Mesquite was killed on sandy soils and on uplands than on heavy, clay sites and on bottomlands. Whitebrush has proved most susceptible to the low-volatile MCP ester. Good results on Silverberry [*Elaeagnus commutata*], Hawthorn, Birch and Dogwood were obtained in Canada from foliage treatments with ground sprayers, using several formulations of 2,4-D, 2,4,5-T and MCP in different concentrations and amounts. Autumn and spring dormant treatments of Silverberry with mixtures of systemic herbicides and TCA were studied in Canada. The treatments in oil gave a complete kill of the wood and were superior to those applied in water. The best results of basal treatment on Mesquite in Texas were with the ester formulation of 2,4,5-T in diesel oil. CMU produced 80% top kill on Mesquite trees when applied at the rate of 1 lb./gal. water.

536. ELWELL, H. M. **Control of brush on rangeland and pastures.** *Res. Rep. 11th ann. Nth. Cent. Weed Control Conf.* 1954 (124–7). O.R.E.

A summary, with abstracts of 4 papers from co-operators in Texas, Oklahoma, Nebraska and the Canadian province of Manitoba. Oak species were satisfactorily controlled with 2–3 annual applications in consecutive years with either 2,4,5-TP (2,4,5-trichloropropionic acid), 2,4,5-T, 2,4-D or a combination of 2,4,5-T and 2,4-D in ester formulations. These chemicals in diesel oil or in an oil/water emulsion (1/3 or 1/4) applied from the air at 4–5 gal./acre, gave very good coverage of the foliage. Buckbrush in Nebraska was successfully controlled with 1 lb./acre of 2,4-D isopropyl ester in water solutions applied annually on 14 and 21 May for 3 successive years. Annual mowing caused considerably less reduction in the number of Buckbrush plants than the treatments with 2,4-D. In Canada, 1½ lb./acre of 2,4-D ester in a single application made just after the full leaf stage, completely killed Buckbrush above the ground line. There was, however, some suckering from lateral roots. Comparable treatments with 2,4,5-T ester gave similar kills.

537. WAYWELL, C. G. **A progress report on the control of Hawthorn.** *Proc. 8th Ntheast. Weed Control Conf.* 1954 (431–4). 3 refs. O.R.E.

The most successful treatment was a basal bark spray using 2,4-D butyl ester in oil at a rate of 2 gal./50 trees. This gave a kill of > 90%. Although treatments were satisfactory at all periods, those made from October through to March proved the most effective. *From author's summary.*

538. SMITH, D. M., HUTNIK, R. J., and PAULSEN, H. A., JR. **Relationship between concentration of basal sprays and mortality of Red Maple sprout clumps.** *Proc. 8th Ntheast. Weed Control Conf.* 1954 (435–9). 2 refs. O.R.E.

It is demonstrated that, in one case at least, the probit of mortality resulting from basal spraying with 2,4,5-T bears a straight-line relationship to the logarithm of the concentration of the spray. If it can be established that this relationship has a wide application, systematic tests of different concentrations could be vastly expedited. The concentration of 2,4,5-T required for a satisfactory kill, when applied in basal sprays, increases very rapidly with stem diameter. Costs for material can be held to a minimum only if undesirable woody vegetation is treated when it is young and small. *From authors' summary.*

539. ANDERSEN, H. E. **Alder control on cutover areas.** *Tech. Note Alaska For. Res. Cent.* No. 25, 1955. pp. 1.

Alder on a deep alluvial flat, logged in 1954, was treated by poisoning with NH_4 sulphamate, applied in cups at 8-in. intervals round the root collar or, for smaller trees, by felling and poisoning the stumps. Treatment was on 22 June, and at the end of 2 months the cambium was dead in practically all trees. No viable seed was produced by the treated trees.

540. SHIPMAN, R. D. **Better Sweetgum control with 2,4,5-T.** *Res. Note Stheast. For. Exp. Sta.* No. 84, 1955. pp. 2.

Small-scale experiments in Santee Experimental Forest showed that, by adding a wetting agent to water and 2,4,5-T applied in frills, or substituting oil for water, Sweetgum can be killed effectively and quickly. Season of applications is important, May being best both for oil and 'wetted' water. A graph shows %s of trees killed 12 months after applying 2,4,5-T with oil, 'wetted' water, or plain water, for each month of the year.

541. WORLEY, D. P., BRAMBLE, W. C., and BYRNES, W. R. **Effect of seasonal basal sprays on root suckering of Aspen.** *Proc. 8th Ntheast. Weed Control Conf.* 1954 (447–52). 3 refs. O.R.E.

A study was made over a period of 4 years in central Pennsylvania. Basal sprays of the bottom 12 in. of stems, at any season, effectively released 6- to 7-year White Pine planted under an Aspen canopy. The most effective time to reduce root suckering of sprayed Aspen proved to be the growing season (June–August); when basal sprays were applied in winter it was necessary to repeat the spray in 3 consecutive years to achieve adequate control. Extremely high concentrations of 2,4,5-T (up to 400 lb./100 gal.) were not as effective as 16–40 lb./100 gal. A kill of Aspen tops did not necessarily mean that all roots were killed. *From authors' summary.*

542. KLÆBO, K., and STORRUSTEN, A. Bekjempelse av mindreverdig lauvskog med hormonpreparater. **[Control of low-value hardwoods with growth regulators.]** *Tidsskr. Skogbr.* 63 (1 (4)), 1955 (156–61). [Nor.]

Discusses work carried out by helicopter and by hand by the Basbolag in central Sweden, using 2,4,-D, 2,4,5-T, and MCPA. Aspen was found difficult to eradicate; Birch was easier, but was more resistant on poor sites than on good. Stronger concentrations were needed on poor soils and at greater heights above sea level. Rates of 1·2–2 litres of herbicide in 25 litres water/ha., i.e. concentrations of 4·5–7·5%, were used for aerial spraying; concentrations of 1–3%, at a rate of 200–300 litres liquid/ha., were used for hand spraying. Details of methods used in foliage and stem spraying, poison-girdling and treatment of stumps are given, with some information, from this work and from Swedish and Norwegian literature, on costs.

543. HOLMES, G. D., and BARNSLEY, G. E. **The chemical control of *Calluna vulgaris* Salisb.** *Proc. Brit. Weed Control Conf.* 1953 (289–96). 10 refs. O.R.E.

Reports experiments carried out in Britain during 1950–52 by the Forestry Commission in conjunction with the Agricultural Research Council (Unit of Experimental Agronomy), and the Shell Agricultural Experimental Station. Vigorous, well established growth of *C. vulgaris* was killed by the following sprays without significant regrowth after 3 years: (1) $NaClO_3$ at 160 lb., (2) NH_4 sulphamate at 47 lb., and (3) Na arsenate at 35·5 lb., all in 100 gal. water/acre; (4) isobutyl ester of 2,4-D at 5 lb. in 160 gal. oil/acre; (5) ethyl ester of 2,4-D at 3 lb. in 100 gal. oil/acre.

Na MCPA was more toxic than Na 2,4-D applied in water. K 2,4,5-T and ethyl-butyl 2,4,5-T were almost ineffective. 2,4-D applied in oil showed much greater phytotoxicity than similar rates applied in water emulsion. Aromatic oils, DNC and PCP in oil caused initial defoliation but regrowth was rapid. The practicability of large-scale application of the successful treatments is limited by the high volumes of oil or water required. [Cf. *For. Abstr.* 15 (No. 1480).] *From authors' summary.*

544. CARPENTER, K., and WILSON, C. **The use of 2,4-D and 2,4,5-T brush killers on railway embankments.** *Proc. Brit. Weed Control Conf.* 1954 (523–33). O.R.E.

Preliminary results of experiments by May and Baker Ltd. Species most successfully controlled so far include Bramble, Briar, Birch, Hazel, Poplar and Willow.

545. SMITH, F. D. **Brush-killers.** *Agriculture (J. Minist. Agric. Lond.)* 62 (5), 1955 (221–4). O.R.E.

Deals with the use of 2,4-D and 2,4,5-T. While winter spraying, using oil instead of water, kills indiscriminately, summer spraying in water checks bramble, but leaves most thorns, e.g. *Crataegus monogyna* and *Prunus spinosa*, little affected. A list shows degrees of susceptibility for 15 species.

546. HARDING, G. F., and EATON, G. O. P. **Some practical aspects of the control of woody growth.** *Proc. Brit. Weed Control Conf.* 1954 (535–41). O.R.E.

Presents tables showing the relative susceptibility of 26 common woody species in the U.K. to summer and winter sprays of ester formulations of 2,4-D, and 2,4,5-T.

547. LUPE, I. Z. Efectele ierbicidului '2,4-D' asupra unor specii lemnoase din perdelele de protecţie. **[The effects of 2,4-D on woody species in**

[Rumanian] shelterbelts.] *Rev. Pădurilor* 70 (1), 1955 (26–31). [Rum.]

The effect of drift of 2,4-D sprays on trees and shrubs in field shelterbelts: *Prunus avium*, *Rosa canina*, *Euonymus europaeus*, *Acer platanoides*, *Salix* spp., and *Quercus robur*.

548. EATON, G. O. P., and HARDING, G. F. **The translocation of selective herbicides in woody growths.** *Proc. Brit. Weed Control Conf.* 1953 (297–302). O.R.E.

Describes experiments on Elder, using a sensitive colour reaction for the detection of 2,4-D.

549. DAWKINS, H. C. **First arboricide trials in Karamoja.** *Tech. Note For. Dep. Uganda* No. 4/55, 1955. pp. 1.

The thorn-scrub species *Acacia mellifera*, *Lannea humilis* and *Commiphora* sp. die 5 months after basal spraying with 0·5–1% butyl 2,4,5-T in dieseline. *Acacia subalata* and *A. nubica* would probably die also. Scandent shrubs should be cut back and 3-ft. regrowth treated. Thick-barked and suckering species require special methods. For cheap thorn-scrub eradication a 2/1 mixture of 2,4-D and 2,4,5-T in 1–2% strength in dieseline would probably be effective.

550. IVENS, G. W. **Some trials with defoliants and arboricides in East Africa.** *Proc. Brit. Weed Control Conf.* 1954 (499–508). 7 refs. O.R.E.

Describes experiments in aerial spraying with butyl 2,4,5-T in diesel oil on two different types of vegetation important as tsetse habitats, (1) evergreen sub-riverain forest, and (2) dense *Commiphora-Combretum* savanna. In (1), the dominant trees were *Olea chrysophylla* and *Euclea divinorum*, and effects on different species are listed. The effect of different dosages was difficult to estimate because of the uneven distribution of the spray, but ca. 0·5 lb./acre of 2,4,5-T is believed to be sufficient to defoliate a large % of trees in this type of bush. Under relatively dry conditions, defoliation persists for 3–4 months with one application. In (2) again, little information could be obtained about effects of varying dosages. Observations to date show that species of *Acacia*, *Albizzia*, *Commiphora* and *Grewia* are rapidly defoliated. Species of *Lannea* and some of *Combretum* react more slowly, while *Markhamia* and *Combretum* spp. are little affected. In both experiments, the trees most rapidly defoliated were the first to produce fresh leaves. Preliminary results are also presented of knapsack sprays with 2,4,5-T on individual species, including *Tarchonanthus camphoratus*, *Commiphora* spp., *Euphorbia matabelensis*, *Isoberlinia globiflora* and *Dichrostachys glomerata*.

442. Parasitic Higher Plants. Climbers and Epiphytes

551. NICHOLSON, D. I. **The effect of 2,4-D injections and of mistletoe on the growth of *Eucalyptus polyanthemos*.** *Leafl. For. Timb. Bur. Aust.* No. 69, 1955. pp. 19. 9 refs.

[Cf. *For. Abstr.* 16 (No. 1884).] Experiments dealing with the effect of 2, 4-D and mistletoe on *E. polyanthemos* are described. A marked increase in the diameter growth of the host occurs for a short period following injection of 2,4-D. This increase becomes very small within a short distance above the level of injection. Apparently most of this increased growth occurs in the bark, though abnormal wood elements are also formed. The reduction in growth caused by mistletoe appears to be due to its replacement of the crown and not to any toxic substance. It rises sharply with heavy infestations. *Author's summary.*

443. Fungi and Bacteria

See also Nos. 180, 462, 675.

552. KRSTIĆ, M. Nové fitopatološke pojave na šumskim vrstama drveća u našoj zemlji. **[New phytopathological phenomena on forest tree species in Jugoslavia.]** *Zašt. Bilja* No. 22, 1954 (3–5). [Croat.e.] I.M.I.

In nurseries: *Phoma negundinis* on *Acer negundo*, *Cytospora pinastri* and *Dothiorella pinastri* on *Pinus nigra*, *Gibberella baccata* on *Sophora japonica*, *Alternaria tenuis* and *A. brassicae* on *Acer* spp., *Fusarium blasticola* on *Ailanthus altissima*, *Cercospora microsora* on *Tilia parvifolia*. In stands: *A. tenuis* on *Robinia*, *C. pinastri* on *Abies alba*, *Ganoderma lucidum* on *A. negundo*, *Dryodon diversidens* on Beech. In avenues: *Cystospora chrysosperma* on Lombardy Poplar, *Schizophyllum commune* on *A. altissima*.

553. GEORGESCU, C. C., and MOCANU, V. V. Contribuţii la cunoaşterea bolilor din culturile forestiere. **[Notes on some forest diseases.]** *Rev. Pădurilor* 70 (1), 1955 (23–6). 4 refs. [Rum.]

Notes on *Phoma libertiana*, *P. picea* and *Ascochyta piniperda* (*Septoria parasitica*) on Spruce; *Fusarium oxysporum* var. *aurantiacum*, *Phoma dura*, *P. abietis* and *Anthostomella rehmii* on Silver Fir; and *Phoma erytella* on Pine.

554. CARTER, J. C. **Arborists' problems with tree diseases—the 6 worst in the Midwest.** *Amer. Nurserym.* 102 (4), 1955 (9–10, 60–5).

Notes symptoms, diagnosis and control of wetwood, *Verticillium* wilt, fire blight (a bacterial disease of many flowering trees), *Cytospora* canker, anthracnose, and scorch (caused by sun, wind, frost etc.)

555. MARTÍNEZ, J. B. Hongos y enfermedades de los chopos en España, incluyendo pudriciones y alteraciones cromogenas de su madera. **[Fungus and other diseases of Poplars in Spain, including wood rots and stains.]** [*Pap.*] *8th Sess. Poplar Comm., Madrid 1955*, No. *FAO/CIP/75-K Add.* 8, 1955. pp. 17. [Span.]

Lists the causal organisms, with literature references.

556. Tratamientos de chopos. **[The care of Poplars.]** *Montes, Madrid* 11 (63), 1955 (237–9). [Span.]

Brief notes on some important insect pests (*Leucoma salicis*, *Dicranura vinula*, *Melasoma populi*, *Sesia apiformis* *Saperda carcharias*, *S. populnea* and *Cryptorrhynchus lapathi*), and fungus

diseases (*Melampsora allii-populina*, *M. castellana*, *M. larici-populina*, *Dothiorella populina* and *D. populnea*), and their control. [Cf. *For. Abstr.* 17 (Nos. 593–4).]

Fungi and Bacteria: Chemical Control (General)

See also Nos. 502, 568, 577.

557. NEISWANDER, R. B. **Compatibility and stability of insecticides and fungicides.** *Amer. Nurserym.* 102 (3), 1955 (19, 97 . . . 106).

Includes a table of 25 commercial preparations, indicating which can be used in combination with which.

443.2. Diseases of Seed and Seedlings; Damping Off etc.

See also Nos. 353–6, 615.

558. **Studies on infection mechanisms using *Phytophthora infestans*.** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1953/54*, 1954 (22).

Inoculation experiments with leguminous plants (*Acacia*, *Cassia*, and *Erythrina* spp.) showed that the parasite penetrates the leaf epidermis, but is checked by a severe 'defence' reaction similar to the local lesion reaction known in cereals infested with rusts and some other fungal parasites. Since the legumes are indigenous to semi-arid and arid regions of Australia and have never been in contact with *Phytophthora*, their reaction cannot be the result of 'adaptation'. This indicates that there are two factors involved in the establishment of a parasitic population: (1) the affinity of the host, and (2) the response of the host tissue to infection. This result throws new light on the mechanism of resistance to infectious diseases.

443.3. Diseases of Older Stages

Stem, Butt and Root Rots; Root Diseases

559. CHILDS, T. W. **Synopsis of present information concerning *Poria weirii* root rot in Douglas Fir.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 116. 1955. pp. 2.

Behaviour of the disease and recommendations for control.

560. KIMMEY, J. W., and LIGHTLE, P. C. **Fungi associated with cull in Redwood.** *For. Sci.* 1 (2), 1955 (104–110). 6 refs.

In the strip containing the 4 northern coastal counties of California (its main range), *Sequoia sempervirens*, has a growing stock of 49,000 million bd. ft., 23% of which is cull, owing, almost exclusively, to the heart rots *Poria sequoiae* (a brown cubical pocket rot), and *P. albipellucida* (a white ring rot), the latter here described on Redwood for the first time. A table based on 495 sample trees from 25 sites shows that, in the southernmost county, 99% of the total rot is due to the former, while in the north (Del Norte County) the % falls to 45. Here the increased incidence of *P. albipellucida* is correlated with the southern limits of another host, *Thuja plicata*. A second table shows the distribution, county by county, of the entrance courts of both fungi. These are, for both, fire scars, broken tops and other wounds exposing bole heartwood, but not broken branches. [Cf. *For. Abstr.* 15 (No. 2742).]

561. DOMAŃSKI, S. Z badań nad zgniliznami drewna olszy czarnej (*Alnus glutinosa* L. Gaertn.) w odrosłowym drzewostanie w Wesolej kolo Siemianic. **[Investigation of heartrot in a coppice stand of Alder at Wesola near Siemianice (Poznań Province, Poland).]** *Acta Soc. Bot. Polon.* 24 (2), 1955 (287–310). 9 refs. [Pol.e.] O.B.D.

Describes investigations carried out on a 51-year Alder coppice stand. Of 137 coppice shoots examined, only 17 appeared to be healthy. Infection in most cases seemed to have entered from the parent stump or from dead adventitious roots. Incidence of decay was correlated with the degree of protrusion of the root system above ground level. Four fungus species were responsible for 77% of butt-rot cases, viz. *Polyporus radiatus* (56%), *Stereum frustulosum*, *S. rugosum* and an unidentified fungus. In 22 cases, 2 or 3 species of decay fungus were isolated from the same shoot. *From author's summary.*

562. DOW, V. B., and GROW, T. **Unusual decay in young Oak plantations following early rodent injury.** *Mich. For.* No. 12, 1955. pp. 2. 3 refs.

Heart rot caused by *Fomes robustus* was found in a 48-year-old plantation of *Quercus borealis* var. *maxima* and *Q. alba*, and it is considered that mouse damage suffered at an early age afforded entry to the infection. This is the first record of *F. robustus* in Oaks in the U.S.

Wilts, Diebacks etc.

See also No. 601.

563. HEPTING, G. H. **The current status of Oak wilt in the United States.** *For. Sci.* 1 (2), 1955 (95–103). 39 refs.

A detailed summary of the present position under the heads: biology, distribution (map), methods of control and the status of control in the various states affected. The bases for appreciation and the planning of control are discussed. Any eastern state could eliminate known infection centres and keep annual watch for a fraction of its expenditure on fire control.

564. BRETZ, T. W. **Some additional native and exotic species of Fagaceae susceptible to Oak wilt.** *Plant Dis. Reptr.* 39 (6), 1955 (495–7). 3 refs. A.P.B.

Presents a list of species of varying provenance proved susceptible to inoculation tests; 21 of these are *Quercus* spp., the others are *Castanopsis kawakamii*, *Lithocarpus densiflorus* and *L. glaber*.

565. TIFFANY, L. H., GILMAN, J. C., and MURPHY, D. R. **Fungi from birds associated with wilted Oaks in Iowa.** *Iowa St. Coll. J. Sci.* 29 (4), 1954 (659–706). 3 refs. O.R.E.

Fungi belonging to 41 genera were isolated from the throats and beaks of 306 birds, mostly woodpeckers, trapped or shot near sound or diseased Oaks, but *Endoconidiophora fagacearum* was not among them.

566. JONES, T. W., and BRETZ, T. W. **Transmission of Oak wilt by tools.** *Plant Dis. Reptr.* 39 (6), 1955 (498–9). A.P.B.

Slicing and sawing tools were used to make bole and crown wounds in healthy trees using (1) tools that had been artificially contaminated, and (2) tools used on wood from infected trees. The fungus was transmitted fairly regularly by (1), but no transmission took place with (2).

567. SPILKER, O. W., and YOUNG, H. C. **Longevity of *Endoconidiophora fagacearum* in lumber.** *Plant Dis. Reptr.* 39 (5), 1955 (429–32). 6 refs. A.P.B.

The longevity of *E. fagacearum* in lumber retaining its bark was affected by temperature and moisture content (m.c.). At 25–27·5° C. its life was only 3–5 weeks; at 5° C. it was still viable after 12 weeks in wood with m.c. 19·3–86·5%. [Cf. *For. Abstr.* 15 (No. 1527).]

568. FERGUS, C. L., COLE, H., JR., and STAMBAUGH, W. J. **The influence of Actidione and other chemicals upon the Oak wilt fungus.** *Plant Dis. Reptr.* 39 (6), 1955 (491–4). 7 refs. A.P.B.

Actidione (cycloheximide, an antibiotic produced by *Streptomyces griseus*) proved the most toxic of all the chemicals tested on *Endoconidiophora fagacearum*. Dissolved in malt-extract agar it completely inhibited germination of endoconidia and ascospores and all growth at 1·0 μg./ml. Pentachlorophenol, $CuSO_4$ and Na arsenite proved toxic, but greater concentrations were required for complete inhibition. Actidione (10 μg./ml.) sprayed on Oak sapwood reduced mycelial invasion by 90%, thus offering some hope for its use in the prevention of mat formation. The toxicity of Actidione at such low concentrations warrants further investigations under forest conditions for Oak wilt control. Its possible use as a chemotherapeutant for shade trees should also be studied. *From authors' summary.*

569. PERSSON, E. Kronenmykose der Hybridaspe. I. Untersuchungen über Auftreten, selektive Wirkung und Pathogenität des Erregers. **[Fungal dieback in the crowns of hybrid Aspens. I. Research on the occurrence, selective effect and pathogenicity of the causal fungus.]** *Phytopath. Z.* 24 (1), 1955 (55–72). 22 refs. [G.e.] O.R.S.

The fungus causing crown dieback in young hybrids (*Populus tremula* × *P. tremuloides*) in S.W. Sweden has been identified as *Valsa nivea*. Trees of the same age and from the same parents in Småland and Värmland have not been affected. Two strains of fungus, one from Ekebo and the other from Sofiero were used in laboratory experiments: the latter grew more rapidly in Petri-dish tests. Cultures of the fungus on bark and cambial tissues grew well on substrates of the hybrid and *P. tremuloides* but poorly on *P. tremula*. Observations on the necrosis caused in leaves of young hybrid Aspen, cut to 30- to 40-cm. lengths, and exposed to cultures of the fungus, showed that toxicity reached a maximum in 10-day-old cultures, decreasing to a minimum in 24-day-old cultures. The differences in lenticel size between *P. tremula* and the hybrid (mean values of 0·06 sq. mm. and 0·10 sq. mm. respectively) may indicate one possible method of infection.

570. WALLACE, G. B., and WALLACE, M. M. **Sudden death disease of Cashew trees in Tanganyika—a preliminary note.** *E. Afr. agric. J.* 21 (1), 1955 (42–3). 2 refs.

Records, from the Southern Province, a disease of *Anacardium occidentale*, probably identical with the 'sudden death' of Cloves in Zanzibar. The root isolate was identified as *Cytonaema* sp., later found to be indistinguishable from *Valsa eugeniae* (conidial stage) either in perithecia or pycnidia. Field symptoms are similar.

Cankers, Stem Rusts etc.

See also Nos. 142, 145.

571. VAARTAJA, O. Havaintoja puiden *Dasyscypha*-lajeista. **[Notes on *Dasyscypha* spp. on trees.]** *Karstenia, Helsinki* No. 2, 1953 (39–41). [Fi.e.] O.B.D.

Measurements of spores and asci (tabulated) suggest that *D. pini* is the common parasite on *Pinus sylvestris* in N. Finland. Damage to trees and seedlings is discussed. *D. subtilissima* was found on Pine and Spruce slash. A similar fungus on a Pine trunk showed a tendency to parasitism. *D. calycina* was found on Larch slash. *From author's summary.*

572. HUBERT, E. E., FERRELL, W. K., and JOHNSON, F. D. **Translocation past bark lesions on young Western White Pine.** *Plant Dis. Reptr.* 39 (6), 1955 (500–3). 3 refs. A.P.B.

The effects were tested of artificially produced bark lesions on the translocation and absorption of liquids in young trees. A species of *Leptographium* was used to produce the lesions. The data, though inconclusive, suggested that when P^{32} was introduced through the roots, there was less activity in inoculated than in control trees.

573. FRASER, L. R. **Canker of *Cupressus* spp. [in New South Wales].** *Aust. Plant Dis. Recdr.* 7 (1), 1955 (14). I.M.I.

The causal fungus of canker on *Cupressus* spp. in New South Wales has been identified as *Monochaetia unicornis*, not *Coryneum cardinale* as was previously supposed.

574. BANTI, G. Note sulla diffusione di *Endothia parasitica* (Murr.) And. nell'Appennino Genovese. **[The spread of *E. parasitica* in the Genoese Apennines.]** *Monti e Boschi* 6 (8), 1955 (351–4). [It.f.e.]

The virulence of the disease on *Castanea sativa* has shown signs of diminishing since 1952 [cf. *For. Abstr.* 13 (No. 3991)] in this region. Three apparent exceptions to the increasing resistance of trees to the disease were examined—in two cases Chestnut was clearly outside its proper range, and the third was a new focus of infection.

575. PAVARI, A. La difesa contro il cancro corticale del castagno (*Endothia parasitica*). **[The control of Chestnut blight (*E. parasitica*).]** *Atti della Accademia Nazionale dei Lincei, Roma (Ser. 8)* 16 (5), 1954 (598–603). [It.] L.S.

Reviews the spread of the disease in Italy, the search for resistant strains of *Castanea sativa* and the possibility of obtaining resistant hybrids.

Foliage Diseases

See also Nos. 315, 615.

576. CHILDS, T. W. **Needle blight of Ponderosa Pine.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 114, 1955. pp. 6.

Its appearance and behaviour in central and eastern Oregon since 1945, kinds and extent of damage, results to date from continuing studies, and recommended timber marking and improvement practices for infected stands.

577. STRONG, F. C., and KLOMPARENS, W. **The control of Red Cedar apple and Hawthorn rusts with Acti-dione.** *Plant Dis. Reptr.* 39 (7), 1955 (569). A.P.B.

Prevention of germination of the teliospores and resultant sporidia production of *Gymnosporangium juniperi-virginianae* was achieved by a single application of cycloheximide (Actidione) at 100 p.p.m. to galls on *Juniperus virginiana* in the spring. Further tests with lower concentrations in summer-grade fuel oil proved 50 p.p.m. or 25 p.p.m. in 0·5% oil, applied in April, to be equally effective. No injury to foliage was observed.

578. ZILLER, W. G. **Studies of western tree rusts. II. *Melampsora occidentalis* and *M. albertensis*, two needle rusts of Douglas Fir.** *Repr.* from *Canad. J. Bot.* 33, 1955 (177–88). 13 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 175.)

Observations at selected field locations, and results of repeated inoculations show that Douglas Fir is an aecial host of *Melampsora occidentalis*. A brief account of the rust's life history is given and the aecial state described from a specimen obtained by inoculation. Arthur's diagnosis of the aecial state of *M. albertensis* is replaced by a new description based on a specimen obtained by inoculation. *Caeoma occidentale* is shown to represent the pycnial and aecial states of *M. occidentalis*, and not of *M. albertensis*. The aecial states of *M. albertensis* and *M. occidentalis*, both occurring on Douglas Fir needles, are identical in gross morphology and time of appearance in nature, but can easily be distinguished from each other by spore size. *From author's summary.*

444. Virus Diseases

579. MUTHANA, M. A. **Spike disease of Sandal (*Santalum album*).** *Indian For.* 81 (8), 1955 (500–8). 13 refs.

An historical account of the spread of the disease and research into its causes and control.

45. Damage by Animals

451. Mammals

See also Nos. 363, 524, 562, 615, 1091.

580. SPENCER, D. A., and KVERNO, N. B. **Research in rodent control to promote reforestation by direct seeding. Progress Report No. 5. A review of chemical compounds that have been screened for rodent protective seed treatment.** Fish and Wildlife Service, U.S. Department of the Interior, Washington. 1955. pp. 32.

Gives tabulated data on composition, application, repellent value, effectiveness of protection, toxicity to mammals and toxicity to seed, of some 335 compounds tested at Denver Wildlife Laboratory. [Cf. *For. Abstr.* 15 (Nos. 1546–7).]

581. GEIS, A. D. **Rabbit damage to Oak reproduction at the Kellogg bird sanctuary.** *J. Wildlife Mgmt.* 18 (3), 1954 (423–4). 2 refs. B.A.P.

A report on a brief study made in the Michigan State College Kellog Bird sanctuary to determine the extent and effect of damage by *Sylvilagus floridanus mearnsii* to regenerating *Quercus velutina*. It was found that 89% of 212 young Oaks examined had been used as winter food. A comparison with undamaged Oak revealed that rabbit-damaged trees have a slower rate of height growth and of stem diameter growth, more main limbs per tree, a greater occurrence of dead main limbs and a higher incidence of heart rot. There was no correlation between height and age in rabbit-damaged trees.

582. GRAHAM, S. A. **Changes in northern Michigan forests from browsing by deer.** *Trans. N. Amer. Wildlife Conf.* 19, 1954 (526–33). B.A.P.

Presents the results of observations made in the western part of the Peninsula, where Pine logging finished in about 1900, with a subsequent period of repeated bush fires up to between 1910 and 1920, followed by a rise in deer populations. Sample plots were established in this area in 1941. A great variety of regenerating species characterized every plot. Seven to 10 years later, however, the effects of deer on the regeneration were evident. Yellow Birch had practically disappeared, Red Maple seedlings had increased in number, but had attained a height of only 4 ft.; Hard Maple had fared better, and, in a few cases, had grown beyond reach of the deer. The most striking change was a surprising increase in Balsam Fir regeneration. More recent observations, begun in 1947, confirmed heavy damage to Yellow Birch, Red Maple, and, to a lesser degree, Hard Maple.

583. CHILDS, T. W., and WORTHINGTON, N. P. **Bear damage to young Douglas-Fir.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 113, 1955. pp. 3 + 4 photos.

Its nature and extent.

584. DELSAUX, R. Gibier et clôture électrique. [**Game and electric fencing.**] *Bull. Soc. for. Belg.* 62 (7), 1955 (340–4). [F.]

Argues that electric fencing is cheaper than ordinary fencing for small areas of a few hectares in the forest. Wires should be not more than 40 cm. apart to keep out roedeer, and should be alternately electrified and non-electrified, and posts should be 7–8 m. apart. Some costs are given.

452. Birds

585. MANN, W. F., JR., and DERR, H. J. **Not for the birds. Morkit, a chemical repellent, solves**

the most difficult problem in direct-seeding Longleaf Pine. *Tree Plant. Notes* No. 20, 1955 (3–6).

One of the principal hindrances to restocking Longleaf Pine stands by direct sowing has been the lack of a practical way of preventing birds from eating the seed. A co-operative project of the Southern Forest Experiment Station and the U.S. Fish and Wildlife Service found that the two most effective chemicals to be used as a bird-repellent seed dressing were Morkit and sublimed synthetic anthraquinone. Morkit, a mixture of anthraquinone and inert ingredients, is manufactured in Germany specifically as a bird repellent. It has no distinctive taste or odour, and the manner in which it acts to repel birds remains to be discovered. It is not known to be harmful to livestock, wildlife, or humans. Field tests with treated seed gave seedling catches of 3000–4000/acre compared with 250/acre for untreated seed. All anthraquinone compounds were good, but Morkit proved the most effective and cheapest ($0·40/lb. compared with $0·88 for sublimed synthetic anthraquinone and $2·15 for Quinizarine). Longleaf seed can be treated with Morkit for $0·15/lb.: this cost comprises all labour and materials, including an asphalt sticker. The necessary equipment can easily be made from two 55-gallon steel drums (illustrated). The method is described.

586. TURČEK, F. **The ringing of trees by some European woodpeckers.** *Repr.* from *Ornis fennica, Helsingfors* 31 (2), 1954 (33–41). 20 refs. [E.e.] B.A.P.

Reviews literature on this subject, giving a list of species ringed in Europe, and presents some observations made in forested areas from the Danube to the Carpathians. Basal parts of the stem are ringed first; later ringing takes place from the top downwards. The vast majority of trees chosen for ringing are either wounded, with broken leaders, suppressed, diseased, or foreign to the community. The immediate purpose of the ringing is sap sucking and probably cambium eating. The author suggests that the ringed trees may have undergone changes in the biochemistry of the sap, or in the season and quantity of circulating sap. From the standpoint of the community the effect is problematical, but it may be beneficial in eliminating undesirable trees.

587. SLÁDEK, J. K ekológii datl'a čierneho (*Dryocopus martius* L.). [**Ecology of *D. martius***.] *Lesn. Práce* 34 (4), 1955 (151–6). [Slovak.]

In spite of the apparent damage done, it is claimed that *D. martius* plays a very useful part mainly by indicating stems that are infested by *Camponotus* ants.

453. Insects

See also Nos. 69–98, 180, 556, 675.

588. SCHIMITSCHEK, E. Die Bestimmung von Insektenschäden im Walde nach Schadensbild und Schädling. [**The identification of insect injuries in the forest, by type of injury and pest.**] Verlag Paul Parey, Hamburg and Berlin. 1955. pp. 196. [G.] Price *DM* 19·80.

Presents 6 tables dealing with pests in nurseries and seedbeds, conifer plantations, conifer stands, broadleaved plantations, broadleaved stands, and osier beds and Willows, plus one table on timber pests and one on the main groups of forest insect larvae, all with numerous supporting illustrations. About 30 host species are mentioned.

589. THALENHORST, W. Entwicklungsmöglichkeiten der Prognose von Gradationen forstlicher Grossschädlinge. [**The prognosis of outbreaks of the major forest pests.**] *Z. PflKrankh.* 62 (8/9), 1955 (572–80). 20 refs. [G.] E.M.B.

590. ŽIVOJINOVIĆ, D., and PETROVIĆ, M. Štetni insekti u parkovima Beograda 1954 godine. [**Insect pests in the parks of Belgrade in 1954.**] *Šumarstvo* 8 (5), 1955 (248–57). 3 refs. [Croat.croat.e.f.]

Nineteen species are described, in particular *Leucoma salicis*, *Ips typographus*, *Pityogenes chalcographus* and *Rhyacionia buoliana*.

591. SWEZEY, O. H. **Forest entomology in Hawaii: an annotated check-list of the insect faunas of the various components of the Hawaiian forests.** *Special Publication, Bernice B. Bishop Museum, Honolulu* No. 44, 1954. pp. ix + 266. 369 refs.

Arranged under plants (trees, shrubs and herbaceous species) in alphabetical order. Under each plant, the associated insects are listed (with notes) by families. There is a general index to both plant and insect species.

592. BROWN, R. T., and YOUNG, E. P. **Insect attacks on native and plantation Pines in Central Wisconsin.** *Ecology* 36 (3), 1955 (522–3). [Dept. of Forestry, Michigan College of Mining and Technology, Houghton, Mich.]

A young plantation of *Pinus banksiana* in southern Wisconsin was found to be infested by the root-collar weevil (*Hylobius radicis*) in the larger trees (⩾ 2 in. diam. at ground level) and by pitch twig moths (*Petrova* sp.) on the smaller. In both cases, an area of natural regeneration of *P. banksiana* was relatively unaffected. This Pine is here near the southern limit of its range; seed for the plantation stock came from northern Wisconsin and may not have been well adapted to the locality.

593. FERNANDEZ DE CORDOBA, L. C., and ZARCO, D. E. Faune entomologique du peuplier. [**Insect fauna of the Poplar.**] [*Pap.*] *8th Sess. int. Poplar Comm., Madrid 1955*, No. *FAO/CIP/75-K Add.* 6, 1955. pp. 10. [F.]

Lists the species found on Poplars in Spain. [Cf. *For. Abstr.* 17 (No. 556).]

594. VIVANI, W. Occorre proteggere fin dall'inizio i nuovi pioppeti veneti dagli insetti xilofagi. [**The protection of young Venetian Poplar plantations from wood-eating insects.**] *Cellulosa e Carta* 6 (7), 1955 (7–10). [It.]

Summarizes current methods of controlling *Cossus cossus*, *Saperda* spp., and *Cryptorrhynchus lapathi* on young Poplars.

Insects: Natural and Biological Control

See also Nos. 101, 603, 619–20, 623–5, 629, 637, 646, 653–4, 656, 659–66, 668–70, 673.

595. KOLUBAJIV, S. Užitečný hmyz a jeho význam pro ochranu lesa. [**Useful insects and their importance in forest protection.**] *Lesn. Knihovna* (*malá Řada*) No. 48, 1954. pp. 87. 59 refs. [Cz.] Price *Kčs*.5.

Lists the main forest insect pests of Czechoslovakia (in alphabetical order of their hosts) and their main insect predators and parasites.

596. KOVAČEVIĆ, Ž. Značaj poliedrie za masovnu pojavu nekih insekata. [**The significance of polyhedral virus disease in the mass outbreaks of some insect species.**] *Zašt. Bilja* No. 23, 1954 (3–20). 21 refs. [Croat.e.] [Poljoprivedno-šumarski Fakultet, Zagreb.] I.M.I.

A review, with special reference to factors, e.g. especially food, influencing latency or appearance of the virus. The author's studies suggest that populations of *Lymantria dispar*, *Malacosoma neustria* and *Euproctis chrysorrhoea*, in the lowlands of the Sava and Drava at least, suffer from latent virus disease which from time to time becomes active.

Insects: Physical Control (General)

See No. 647.

Insects: Chemical Control (General)

See also Nos. 502–3, 557, 651.

597. ENGLISH, L. L. **The need for common sense in the control of insect pests.** *J. econ. Ent.* 48 (3), 1955 (279–82). 36 refs.

Discusses examples of the use of insecticides exposing the crop to other pests, occasions when it is best to do nothing, accumulations of poison in the soil, integration of chemical with biological control, building up of insecticide resistance, production of poisons specific to the pests, repellents, systemics, the need for quantitative data on crop yield improvement, and the proposition that insecticides are useful mainly in epidemics and are not good prophylactics.

598. CRAMER, H. H. Der Stand unseres Wissens über die Auswirkung grossflächiger Schädlingsbekämpfung auf Waldbiozönosen: ein Sammelbericht über den Stand des Wissens. [**Our knowledge of the effect of large-scale pest control on forest biocoenoses: a review.**] *Z. PflKrankh.* 62 (7), 1955 (422–35). 91 refs. [G.e.] E.M.B.

Discusses the effect, in particular on soil fauna and fish, of As preparations, drugs of plant origin, DNC, and (in more detail) modern organic/synthetic poisons, used as insecticides.

599. SATCHELL, J. E. **The effects of B.H.C., D.D.T. and parathion on soil fauna.** *Soils and Fertil.* 18 (4), 1955 (279–85). 27 refs.

A review of literature since 1945.

600. TURNER, N. **Tests for type of action of hydrocarbon insecticides applied jointly.** *Bull. Conn. agric. Exp. Sta.* No. 594, 1955. pp. 24. 27 refs.

Reviews the literature and gives the results of the author's own experiments. A large proportion of the chlorinated insecticides unquestionably acted similarly and would be of little use in controlling insects that had developed resistance to any one of them.

601. **Mist spraying and Dutch Elm disease control.** Oliver Corporation, York, Pennsylvania. 1954. pp. 72.

A collection of leaflets, reprints etc., on the disease and its control, including comparative costs of hydraulic and mist spraying, description and specifications for the Oliver Iron Age mist sprayers, discussion of the mechanics, coverage and control of mist spraying, and prices.

Orthoptera

See also No. 357.

602. CHATTERJEE, P. N. **Ecology and control of the cricket, *Gymnogryllus humeralis* Walker (Orthoptera, Gryllidae) a minor pest of *Casuarina equisetifolia* Forst. seedlings in Bombay State, with a list of other pests of *Casuarina*.** *Indian For.* 81 (8), 1955 (509–15). 1 ref.

Only plants < 2 ft. in height are attacked. The cricket is polyphagous and avoids poisoned food, so is difficult to control.

Isoptera

See Nos. 71–4, 966.

Hemiptera

See also Nos. 75–7, 167.

603. TEUCHER, G. Zum Massenwechsel der Douglasien-Wollaus (*Gilletteella cooleyi* (Gill.) C.B.) in Deutschland. [**The outbreak of *Adelges cooleyi* in Germany.**] *NachrBl. dtsch. PflSchDienst.* 9 (6), 1955 (102–8). 21 refs. [G.]

Presents some observations on biotic and abiotic factors that might act as agencies limiting the spread of this pest in Germany [cf. *For. Abstr.* 14 (No. 2446)]. On the whole, abiotic factors, in particular precipitation, seem to have greater influence than biotic factors, but the confirmed spread of the pest indicates that under central European conditions no normal biological control can be expected.

604. TESDORFF, H. Befall an *Pinus sylvestris* und *P. austriaca* durch eine *Adelges*-Art in der Südkordillere Argentiniens. [**Infestation of *P. sylvestris* and *P.* [*nigra* var.] *austriaca* by a species of woolly aphid in the Southern Cordillera of Argentina.**] *Z. Weltforstwirt.* 17 (4), 1954 (148). [G.]

From 1925 onwards, plantations of 19 Pines and some other conifers were made in acclimatization trials in Isla Vitoria National Park (Lake Nahuel Huapi) and elsewhere. In 1945 it was observed that 7- to 9-year Scots and Austrian Pines were infested by an aphid species—presumably of the genus *Pineus*. By 1946–47 all stands of these species, of all ages, were covered with their white webs, and weaker individuals had died. Cutting out dead and severely affected trees was ineffective. *Pinus contorta* interplanted with *P. sylvestris* was not

attacked, nor were any other *Pinus* species. A few individuals of *P. sylvestris* showed resistance to the pest, but it could not be ascertained whether these were of Scottish, Hessian, or Finnish origin.

605. ADAMS, W. R. **A control for Pine leaf aphid.** *Bull. Vt. agric. Exp. Sta.* No. 582, 1955. pp. 8. 3 refs.

Pineus pinifoliae infesting *Pinus strobus* in Vermont was successfully controlled by thorough spraying from the ground with miscible oil diluted with water, at the rate of 1 quart oil to 32 quarts water and applied at 10·4 gal. solution/acre. Spraying must be done at the critical moment when larvae are migrating, since both adults and eggs are unharmed by spraying.

606. BEAN, J. L., and GODWIN, P. A. **Description and bionomics of a new Red Pine scale, *Matsucoccus resinosae*.** *For. Sci.* 1 (2), 1955 (164–76). 25 refs.

The 14 known N. American species of *Matsucoccus*), with their 19 Pine hosts and occurrence, are listed. All stages of the Red Pine scale [*M. resinosae*] are described, with drawings, and the distribution, host relationship, effect on host, economic importance, habits, seasonal history and chemical and natural control are covered. This scale and *M. pini* (on *P. sylvestris* in S. England) are closely similar morphologically and in being the only species known with 2 generations, but they differ in the latter's being parthenogenetic and in their host preference and distribution. Preliminary field tests indicate Systox and 2% oil emulsion as effective in chemical control. [Cf. *For. Abstr.* 13 (No. 2293).]

607. **Study of resistant Cedars.** *Staff Reports of the Department of Agriculture* [*Bermuda*] *for the year 1953*, 1954 (2–3).

Examination of ten scale-resistant Cedars (*Juniperus* spp.) and ten badly infested ones showed that there were almost 4 times as many scales on the latter. Thorough investigation of the environment and physical examination of the trees, revealed only three differences: (1) most of the resistant trees (70%) were ♂, (2) the glands on the needles of the resistant trees were slightly shorter than on the susceptible, and (3) there were more oil globules in their needle tissue. Chemical analyses of needles and berries showed that ether extracts (resins, waxes etc.) were more abundant in the berries of resistant trees than in the susceptible. This was particularly evident in berries of *J. silicicola*, the most resistant species growing in Bermuda.

608. **Green shield scale [*Pulvinaria psidii*].** *Staff Reports of the Department of Agriculture* [*Bermuda*] *for the year 1953*, 1954 (4–5).

This scale insect has recently begun to attack Oleanders, Citrus species and many other trees and shrubs in Bermuda. A study was made of its life history; the insect appears to be parthenogenetic and its growth and development are relatively slow. Experiments showed that it can be controlled by spraying with malathion (6 lb./100 gal. water).

Lepidoptera

See also Nos. 78–80, 143, 590, 592, 594, 596.

609. BRENY, R. Quelques observations et considérations sur *Sciapteron* (*Sesia*) *tabaniforme* Rott en Belgique. [***S. tabaniforme* [on Poplars] in Belgium.**] *Spec. Pap. 8th Sess. int. Poplar Comm., Madrid 1955*, No. *FAO/CIP/75-D, Add.* 1, 1955 (97–9). [F.]

Gives notes on some occurrences. Attack is usually through recent wounds.

610. GUASP, J. T. Lutte contre les parasites térébrants du peuplier. [**Control of Poplar borers.**] [*Pap.*] *8th Sess. int. Poplar Comm., Madrid 1955*, No. *FAO/CIP/75-K, Add.* 5, 1955. pp. 3. [F.]

A plantation of 60,000 Poplars (3–4 cm. diam.), of which 18,000 were infested by borers, mainly *Sesia apiformis* and *Saperda populnea* (averaging 2 larvae/tree) was successfully treated by injecting a preparation containing 2·5% DDT + 2·5% BHC, into the larval holes. Using a crew of 3 men—2 to clear the holes with a piece of wire and one to inject the insecticide—the total cost per tree was 0·3 pesetas.

611. BENNETT, W. H. **The effect of needle structure upon the susceptibility of hosts to the Pine needle miner (*Exoteleia pinifoliella* (Chamb.) (Lepidoptera: Gelechiidae).** *Canad. Ent.* 86 (2), 1954 (49–54). 6 refs. O.R.S.

Observations on 7 *Pinus* species showed a correlation between the internal structure of the needle and its susceptibility to injury by *E. pinifoliella*. Factors affecting susceptibility (apart from tree vigour) are the number, position, and size of the resin canals within the needle. In the plantations studied, Lodgepole and Jack Pine were the most favoured hosts, having only two, moderate-sized resin canals, situated one in each corner of the needle, so that larvae could feed with little or no interference from resin flow. Table-Mountain Pine [*Pinus pungens*] was less favoured; 2 to 7 canals per needle are typical for this species. Ponderosa ranked next in order of susceptibility; needle structure was similar to that of the more preferred hosts, but the canals were very large. Trees growing on poor sites were more severely damaged than others, and an association with the intensity of resin flow is possible. Scarcity of Pitch Pine prevented comparative studies. Red Pine was only slightly infested, large canals interfering with the normal mining habits of young larvae. Scots Pine was an unfavourable host. Conspicuous resin canals varied from 6 to 16 in different needles, and the higher the number the greater the resistance.

612. WACHTENDORF, W. Über die Bekämpfung der Lärchenminiermotte. [**Control of *Coleophora laricella*.**] *Anz. Schädlingsk.* 28 (7), 1955 (101–2). 4 refs. [G.]

Presents a table showing the results of spring and autumn spraying with Systox, Metasystox, 4410 and 4455 from the Farbenfabriken Bayer, Leverkusen.

613. BELLIS, E. DE. De l'hivernage d'une tordeuse des peupliers. [**Hibernation of a Poplar tortrix.**] [*Pap.*] *8th Sess. int. Poplar Comm., Madrid 1955*, No. *FAO/CIP/79-A*, 1955. pp. 2. [F.]

Observations on the larva of an unidentified species of *Semasia* or *Gypsonoma* which hibernates in the buds of Poplars. [Cf. *For. Abstr.* 15 (No. 1581).]

614. CUMMING, M. E. P. **Notes on the Spruce needle miner, *Taniva albolineana* Kft. (Olethreutidae: Lepidoptera).** *Canad. Ent.* 86 (10), 1954 (457–60). 5 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 165.) O.R.S.

Description, habits and life history.

615. SCHWERDTFEGER, F. Aktuelle Fragen des Forstschutzes. [**Topical problems of forest protection.**] *Holz-Zbl.* 81 (115), 1955 (1377–8). 4 refs. [G.]

Recent distribution (outbreaks) and experience in the control of the following: *Lophodermium pinastri*, *Rhyacionia buoliana*, *R. turionana* and *R. duplana*, *Panolis flammea*, *Pristiphora abietina* and *Microtus agrestis* in N.W. Germany.

616. SCHWERDTFEGER, F., and SCHNEIDER, G. Untersuchungen zur chemischen Bekämpfung des Kiefernknospentriebwicklers (*Evetria buoliana* Schiff.). [**Investigation on the chemical control of *Rhyacionia buoliana*.**] *Z. PflKrankh.* 62 (7), 1955 (417–22). [G.g.e.] E.M.B.

Field trials in 1951–52 and 1953–54 showed that the type of insecticide used (DDT, BHC or E [Parathion]) and the form of application (dust, suspension, emulsion) did not significantly affect the results, but that concentration or rate of application must be several times higher than the normal dosage. Control may be effectively carried out by spraying, or spreading a DDT/BHC mixture on the terminal shoot.

617. DAVIAULT, L. Le problème de la tordeuse des bourgeons de l'épinette. [**The problem of the Spruce budworm.**] *C.R. 34e Assembl. ann. Ass. Ingén. for. Québec* 1954 (5–22). 42 refs. [F.]

Reviews the present state of knowledge and results of research on the epidemiology, damage, and control of the Spruce budworm.

618. MCGUGAN, B. M. **Needle-mining habits and larval instars of the Spruce budworm.** *Canad. Ent.* 86 (10), 1954 (439–54). 25 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 169.) O.R.S.

The basic pattern of needle-mining activity on Balsam Fir was the same in all years regardless of widely divergent weather conditions. Most larvae mine only one needle before entering the vegetative buds. A few larvae enter compact buds directly and a few mine additional needles. The number of larval instars was ascertained through individual rearing and the measurement of head capsules of larvae collected and preserved throughout the developmental period. The characteristic number of instars for field populations was six. In an attempt to find means of identifying the larval instars, the head width, setal patterns, colour patterns and pro-leg crochets were studied. No single criterion was found to separate all instars, but using a combination of features a key was prepared that will establish the instar of most larvae satisfactorily. The best single criterion is head-capsule width; it varies, however, between the sexes, ♀s being larger, and is markedly influenced by certain parasites. *From author's summary.*

619. MCGUGAN, B. M. **Certain host-parasite relationships involving the Spruce budworm.** *Canad. Ent.* 87 (4), 1955 (178–87). 8 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 200.) O.R.S.

Presents data derived from the rearing of periodic collections of Spruce budworm and the dissection of budworm larvae and pupae, and draws some conclusions on parasite sex-ratios and the influence of the parasite on the apparent sex of the host, on the rate of host development and on host size.

620. HOUSE, H. L. **Nutritional studies with *Pseudosarcophaga affinis* (Fall.), a dipterous parasite of the Spruce budworm, *Choristoneura fumiferana* (Clem.). 1. A chemically defined medium and aseptic-culture technique. 2. Effects of eleven vitamins on growth. 3. Effects of nineteen amino acids on growth. 4. Effects of ribonucleic acid, glutathione, dextrose, a salt mixture, cholesterol, and fats.** *Canad. J. Zool.* 32 (5), 1954 (331–65). Many refs. (*Contr. Ent. Div. Dep. Agric. Can.* Nos. 3205–3208). O.R.S.

621. MCLINTOCK, T. F. **How damage to Balsam Fir develops after a Spruce budworm epidemic.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 75, 1955. pp. 18.

A study was made of Spruce budworm damage during a heavy outbreak from 1944 to 1950 in S.W. Quebec. The results, and their application to conditions in Maine and New Hampshire are discussed. The first mortality was observed in 1948 and the first heavy mortality in 1949. In the overstorey there was little significant difference in mortality in the d.b.h. classes 4–5 and 6–8 in., but from 9 in. upwards mortality was about 10% higher each year than in classes below 9 in. The effect of the attack on the understorey could not be determined reliably. No relationship could be found between tree vigour and mortality. Dominant and intermediate trees sustained heavier losses than overtopped (but not suppressed) ones, presumably because the insect tends to feed and to lay its eggs in the light. Mortality was heavier (89%) among trees suffering from heavy than among those suffering from medium or light defoliation (55%), and in trees having a short crown (crown ratio 0·1–0·3) than in those with longer crowns. No consistent relationship was found between site quality and mortality, probably because of the existence of local centres of infestation, but there was a tendency to higher mortality on poorly drained sites. A study of increment cores from > 100 trees showed a drop in diameter increment in all trees, regardless of condition, beginning 1–6 years, and most marked 5–6 years, after the first defoliation. This drop continued for at least 3 years after defoliation ended, i.e. to the end of the period of the investigation. Probable future mortality caused by defoliation during the outbreak is estimated.

622. VALEŠ, A. Obaleč korunový v obvodu SLH Veveří u Brna. [***Epiblema nigricana* in the Veveří forest range near Brno.**] *Lesn. Práce* 34 (7), 1955 (319–22). [Cz.]

Describes the damage done to Silver Fir, and recommends moderate thinning as one of the measures to be adopted.

623. WALLEY, G. S. **Notes on *Acrobasis rubrifasciella* Pack. (Lepidoptera: Phycitidae), with a list of its parasites.** *Canad. Ent.* 86 (6), 1954 (255–60). 10 refs. (*Contr. Div. Ent. Dep. Agric. Can.* No. 3189.) O.R.S.

624. BLAIS, J. R., PRENTICE, R. M., SIPPELL, W. L., and WALLACE, D. R. **Effects of weather on the forest tent caterpillar *Malacosoma disstria* Hbn., in central Canada in the spring of 1953.** *Repr.* from *Canad. Ent.* 87 (1), 1955 (1–8). 5 refs.

In 1953, populations of the caterpillar were drastically reduced by unseasonably high temperatures in early May, causing eggs to hatch and Aspen foliage to open, followed by several days of frost and snow, and several weeks of cool, wet weather. In northern Ontario many of the larvae succumbed to the frost, while many more died of starvation since most of the Aspen foliage was also killed by the frost. Further west, in Manitoba, fewer larvae were killed directly by the frost and the Aspen foliage was not destroyed to the same degree; but the succeeding cold, wet weather caused high larval mortality. The parasite, *Sarcophaga aldrichi*, which had been multiplying during the previous few years in this region, was not affected by the abnormal weather, and further reduced the residual tent-caterpillar population. *From authors' summary.*

625. CLARK, E. C. **Observations on the ecology of a polyhedrosis of the Great Basin tent caterpillar *Malacosoma fragilis*.** *Ecology* 36 (3), 1955 (373–6). 10 refs. [College of Agriculture, Berkeley, Cal.]

The tent caterpillars (*Malacosoma* spp.) have been known for some time to be susceptible to polyhedrosis disease, which has been observed to be an important factor in terminating widespread outbreaks of the Great Basin tent caterpillar (*Malacosoma fragilis*) as well as outbreaks of other members of the genus.

Observations on a polyhedrosis epizootic among tent caterpillars in nature showed the disease to be capable of destroying almost all the insects present and of preventing the development of a second generation. Studies on the generation-to-generation transmission of the virus appear to indicate that ovarial transmission plays an important role in carrying the virus through the 9- to 10-month period during which no susceptible stage of the insect is present. Host-plant contamination may also be important in this respect. The virus was shown to survive the winter on the host plant and to be a potential source of infection for developing larvae.

Several colonies of young larvae were treated with the virus and then placed on plants carrying untreated insects. The subsequent death of the latter indicated that under the conditions of the test the disease may spread fairly rapidly among the larvae of a single generation. *From author's summary.*

626. ORR, L. W. **The 1953 Pine butterfly [*Neophasia menapia*] outbreak in southern Idaho and plans for its control in 1954.** *Misc. Publ. Intermt. For. Range Exp. Sta.* No. 1, 1954. pp. 12.

627. BOGAVAC, M. Pojava jedne štetne grbe na bagremu. [**Occurrence of a geometrid pest on *Robinia pseudoacacia*.**] *Zašt. Bilja* No. 22, 1954 (103–4). 3 refs. [Croat.e.] I.M.I.

An outbreak of *Boarmia crepuscularia defessaria* in company with *B. crepuscularia* and *B. consortaria consobrinaria*, occurred in May 1952 in an extensive Robinia plantation, defoliating 87 ha. Some other deciduous species were also attacked. Pupation began at the end of May and a second generation began to attack in the first few days of July. By 10 July, however, the caterpillars were destroyed by a disease. Parasites and predators were insignificant in reducing the pest.

628. **Pine looper moth (*Bupalus piniarius*).** *Leafl. For. Comm., Lond.* No. 32, 1955. pp. 8.

Description and life history, nature of outbreaks, and methods of control.

629. HUSSON, R. Cas de polyédrose chez le géométride *Ennomos quercinaria* Hufn. et considérations générales sur les polyédroses. [**A case of polyhedral virus disease in *E. quercinaria* and general considerations on such diseases.**] *Rev. Path. vég.* 33 (4), 1954 (208–21). 52 refs. [F.] [Université de la Sarre.] I.M.I.

Describes an epidemic of this defoliator of Beech and Hornbeam in the Saar forests, now recorded for the second time after 35 years. The build-up took 3 years and its collapse followed the intervention of polyhedral virus, *Borrelinia saraviensis* sp. nov. A similar interval between epidemics, build-up period and collapse due to virus occurs in *Lymantria* on the Mediterranean evergreen Oaks, and ca. 12 other instances are quoted, including another *Lymantria*, *Neodiprion* [cf. *For. Abstr.* 14 (No. 519)] and *Semasia*, of pests falling victim to polyhedral virus, often at the height of their outbreaks. Parts of the Saar forest were dusted with 10% DDT with success against caterpillars but also some burning of foliage in places. It is argued that chemical control is reprehensible as preventing, at the height of the epidemic, a parallel and equally massive build-up of natural control. General information is given on these viruses.

630. SCHIMITSCHEK, E. Zur Kenntnis des Pappelschädlings *Pygaera anastomosis* L. (Lep.—Fam. Notodontidae). [***P. anastomosis*, a pest of Poplar.**] *Anz. Schädlingsk.* 28 (10), 1955 (153–6). 6 refs. [G.]

Notes on morphology, life history and nature of damage.

631. THIEM, E., and WIEGAND, H. Beobachtungen und Vorschläge zur Bekämpfung des Goldafters (*Euproctis chrysorrhoea* L.). [**The control of *E. chrysorrhoea*.**] *NachrBl. dtsch. PflSch-Dienst.* 9 (7), 1955 (124–8). 15 refs. [G.]

Presents the results of experiments both in the orchard and in the forest. Mid-summer treatments

may be successful and are of particular value in new infestation areas, where populations are building up. In old infestation areas treatment may be postponed until spring. In orchards, emulsion sprays with a DDT or BHC base are recommended, while in the forest aerosols are preferable. Insecticides with a relatively lengthy residual effect are recommended in order to treat both early- and late-emerging larvae. Times suitable for successful treatment are limited, and careful watch must be kept on oviposition and larval emergence. [Cf. *For. Abstr.* 15 (No. 3811).]

632. JANKOVIĆ, L. Neka zapažanja u vezi visinskog rasprostranenjenja gubara. **[Some observations on the vertical spread of *Lymantria dispar* [in Jugoslavia].]** *Zašt. Bilja* No. 23, 1954 (102–3). 6 refs. [Croat.e.] I.M.I.

The author's observations indicate that *L. dispar* readily adapts itself to different climates, e.g. at different altitudes, causing damage in 1949 as high up as 1100–1150 m. The size of the ♀ imago appears to vary much with altitude. The times of the developmental stages also vary considerably: the latest pupation observed in the forest was in mid-Sept., and a ♀ emerged from this pupa in the laboratory in October.

633. ENE, M., and ALMĂŞAN, H. Distugerea ouălor de *Lymantria dispar* L. de către entomofagi in pădurea Babadag. **[Destruction of *L. dispar* eggs by insect predators in Babadag forest.]** *Rev. Pădurilor* 70 (5), 1955 (225–7). 6 refs. [Rum.]

Predation by larvae of a *Dermestes* sp. appears to cause the loss of many eggs of *L. dispar*, and the possibility of artificial introduction of this species is discussed. Predation by *Neosoma elongatum* was also observed.

634. CORLISS, J. M. **Damage to our forests caused by the gypsy moth in 1953.** *J. econ. Ent.* 48 (3), 1955 (263–4).

Gives for the 6 N.E. states of the U.S.A. affected, the acreage defoliated (100% and 75%) by *Lymantria dispar* in 1953. Recorded defoliation (in thousands of acres) for 1929, '37, '45 and '53 was 551, 609, 821, and 1487 respectively, this 8-year cycle being attributed to climate and variation in natural biological control. Notes are added on the probable spread of larvae by the 1953 tornadoes and precautions against spread into new areas. [Cf. *For. Abstr.* 8 (No. 1405).]

635. KUDLER, J. Mniška (*Lymantria monacha* L.) opět ohrožuje naše lesy. **[*L. monacha* is again a menace to Czechoslovakian forests.]** *Lesn. Práce* 34 (4), 1955 (165–7, 170). [Cz.]

Describes the extent of attack in Czechoslovakia in 1953 and 1954. The area involved, very small in 1953, amounted to some 120 ha. in 1954, and all available data point to the outbreak's gathering impetus.

636. **The White Cedar moth.** *Agric. Gaz. N.S.W.* 65 (3), 1954 (166–7). I.M.I.

Notes on *Lymantria reducta*, a pest of *Melia azedarach* in New South Wales. It can be controlled by spraying with 0·1% DDT.

Coleoptera

See also Nos. 81–9, 463, 590, 592, 594, 656, 948, 965.

637. JOVER, H. Contribution a l'étude biologique des coléoptères xylophages de Basse Côte-d'Ivoire. **[The biology of the wood-boring beetles of the lower Ivory Coast.]** *Rev. Path. vég.* 33 (4), 1954 (222–31). 4 refs. [F.] I.M.I.

[Cf. *For. Abstr.* 16 (No. 4331).] Lists 20 bostrychids, 10 of which are important pests of growing or felled timber, with notes on life history, form of gallery, commensals, predators, parasites, distribution and host trees, including plantation crops (Coffee, Cacao).

638. ELIESCU, G., and DISESCU, G. Experimentări in legătură cu biologia şi combaterea trombarului ghindei. **[Experiments in the control of insect pests of acorns.]** *Rev. Pădurilor* 70 (3), 1955 (124–7). 9 refs. [Rum.]

Spraying of Oaks in August and in September, with Pb arsenate, Ca arsenate, or Paris green, gave some control of *Curculio glandium* and *Carpocapsa* spp. Paris green was the most effective, increasing the number of sound acorns by 28·7% compared with 12·1% for the other two. Duolith F (DDT dissolved in mineral oil), applied freely to the bark of a tree in a ring 30 cm. wide, and renewed at intervals between 11 Aug. and 24 Sept., increased the number of sound acorns by 13·7%. The purpose of the experiments was to protect the acorn crop on seed trees.

639. PETROVIĆ, N. Mali borov surlaš preti da uništi borovu kulturu i podmladak na Maljenu. **[*Pissodes notatus* threatens Pine plantations and natural regeneration on Mt. Maljen with destruction.]** *Zašt. Bilja* No. 23, 1954 (101–2). [Croat.e.] I.M.I.

Most of the deaths in 3- to 10-year *Pinus sylvestris* regeneration, and ca. 35% of those in 3- to 5-year plantations of *P. sylvestris* and *P. nigra*, on this mountain in Serbia in 1952–53, were caused by *Pissodes notatus*, the rapid spread of which is considered a grave danger. Control requires the immediate destruction by burning of all sickly and dead plants, whether planted or of natural origin.

640. HOLST, M. J. **An observation of weevil damage in Norway Spruce.** *Tech. Note For. Br. Can.* No. 4, 1955. pp. 3.

Norway Spruce (*Picea abies*) may be of great value for planting in Eastern Canada, but is very susceptible to weevil (*Pissodes strobi*) damage. A study was made at Petawawa on 24 trees, survivors of a 30-year-old plantation, to investigate the relation between branching habit and weevil damage. It was found that trees with broad crowns were more often damaged than those with narrow, and those with low height/diam. ratios more often than those with high ratios. Three of the trees were double-stemmed and therefore very slender, and these were highly resistant to weevil damage. A relation was also found between height/diam. ratio and height above ground of the first damaged leader. Stout trees were all damaged earlier than slender trees. The 'comb' Spruce had larger crown diameters and

showed more weevil damage than the brush types. For the material investigated, it would appear that slender genotypes with narrow brush-type crowns are associated with light weevil damage and that selection of Norway Spruce for use in Canada should concentrate on these types.

641. VITÉ, J. P. Die Behandlung des Sturmholzes. **[The treatment of windthrows.]** *Holz-Zbl.* 81 (112), 1955 (1333–6). 14 refs. [G.]

Investigations were made on storm-damaged stands (mainly Spruce) in the districts round Hann. Münden to ascertain whether, with the help of chemical control of barkbeetles, logging could be spread over more than one felling season, thus preventing deterioration of summer felled timber and avoiding hasty, i.e. insufficient, clearing of sites, the latter possibly presenting as great a barkbeetle hazard as delayed logging. Infestation experiments in June/July with *Ips amitinus*, *I. typographus* and *Pityogenes chalcographus*, and examination of natural infestations, showed that windthrown trees were attacked only in exceptional cases and that snags were readily attacked, though not significantly more so than stocks of converted timber and logs left unbarked in the forest. *Xyloterus lineatus* and *I. amitinus* were the chief species, others being observed only sporadically. Infestations were concentrated at scattered points, chiefly on dry, warm, western aspects. Preventive spraying was ineffective, but careful poisoning, by spraying or painting, of infested trees or stumps with the BHC preparation 'Mobe T' proved largely successful and gave protection for 21 days or longer. An analysis was also made of the way in which trees were thrown, comprising measurements of their distance from the ground at 3 points (butt, ½ and ¾ length, the crown being ignored), results being presented graphically for various types of windthrow, showing that in stands of average density the majority of thrown stems do not touch the forest floor.

It is concluded that, with the necessary safeguards, the logging of certain storm-damaged areas could with advantage be held over until the following winter.

642. HELLER, R. C., COYNE, J. F., and BEAN, J. L. **Airplanes increase effectiveness of Southern Pine beetle surveys.** *J. For.* 53 (7), 1955 (483–7). 2 refs.

Describes the organization and technique of aerial reconnaissance for operations against outbreaks of *Dendroctonus frontalis*, which killed ca. 112 million bd. ft. of *Pinus taeda* and *P. echinata* in Mississipi and Texas during 1950–52. Costs in $ per 1000 acres for ground survey (California) were 66·70 compared with 0·43 for aerial survey, which is vastly quicker. [Cf. *For. Abstr* 16 (No. 4286).]

643. FRANCKE-GROSMANN, H., and RÜHM, W. Die Bekämpfung des Riesenbastkäfers (*Dendroctonus micans* Kug.). **[The control of *D. micans*.]** *Z. Weltforstwirt.* 17 (2), 1954 (48–53). 16 refs. [G.e.f.]

After outlining the occurrence of *D. micans* on *Picea glauca*, *P. abies* and (chiefly) *P. sitchensis* in Schleswig-Holstein, its biology, habits, and symptoms of attack, the author discusses chemical control, the felling and barking of infested trees having proved ineffective. The only spray that fulfilled the requirements of deep penetration, at least partial dissolution of the resin covering of the galleries, and rapid action, was 'Mobe T', a highly inflammable, corrosive BHC preparation [cf. *For. Abstr.* 16 (No. 4335)]. Instructions for use are given. In heavily infested areas, sound, freshly cut stumps should be treated with a contact insecticide. Preventive measures and suitable restrictions in the future use of Sitka Spruce in Germany are recommended.

644. JOHNSON, P. C. **A hibernation record of *Ips plastographus* Leconte (Coleoptera: Scolytidae).** *Canad. Ent.* 86 (9), 1954 (431–2). 1 ref. O.R.S.

Describes an instance of new adults hibernating in short tunnels in the sapwood of windthrown Lodgepole Pine at 6100 ft. alt. in the Kootenai National Forest, Montana.

645. MARTÍNEK, V. Nepodceňujme význam sesterského pokolení kůrovce (*Ips typographus* L.) při asanaci ohnisek. **[Let us not underrate the importance of the second egg-laying of *I. typographus* when dealing with foci of infestation.]** *Lesn. Práce* 34 (3), 1955 (125–9). [Cz.]

A study of the development of *I. typographus* in Bohemian stands in 1953, showed that the fluctuation of spring swarming observed, particularly in the late phase (June–July), was due to the emergence of second broods. Further investigations in 1954 near Horšovský Týn (alt. ca. 500 m.) indicated that ca. 80% of the ♀ beetles lay eggs for a second, and as many as 10% for a third time. The second and third broods are just as dangerous as the first. Hence greater attention should be paid to killing the 'old' (first) beetle generation.

646. WICHMANN, H. Kleinsäuger als Feinde des Buchdruckers, *Ips typographus* (Linné, 1958) (Coleoptera). **[Small mammals as enemies of *I. typographus*.]** *Säugetierkundliche Mitteilungen, Stuttgart* 2 (2), 1954 (60–6). [G.] B.A.P.

Short notes made from observations on the following predators: *Sorex a. araneus*, *S. m. minutus*, *Erinaceus e. europaeus*, species of bats, *Microtus arvalis*, *Clethrionomys glareolus*, *Apodemus a. agrarius*, *A. fl. flavicollis* and *Sciurus vulgaris fuscoater*.

647. KALÁB, J. Hubení kůrovce elektřinou. **[Killing of barkbeetles by electricity.]** *Lesn. Práce* 34 (1), 1955 (27–31). [Cz.]

Laboratory tests showed that hibernating imagos, as well as larvae and pupae, of *Ips typographus*, when placed in glass or cellophane between the electrodes of a 70-watt, 40 megacycle/sec. apparatus, were killed within 4–8 sec. When the insects were inside the bark (with or without wood), the time required was 20–30 sec. and up to twice this value. The loss due to the heating of wood was not reduced with apparatus of 30–40 and 300 megacycles/sec. and 70–1000 watts. Better results were obtained with H.F. current of 70 megacycles/sec. (30–70 watts) applied to the bark (sometimes on the trap-stems), when both

electrodes (wire in this case) were in direct contact with the bark; one electrode was driven into the cambium layer, while the other was moved over the surface of the bark. The time of killing was probably a few seconds. This method does not heat the wood unduly. The author recommends starting fundamental research on the conductivity and dielectric constant of wood and insects, and on the cause of 'electric killing'.

648. NEGRU, Ş. *Xyleborus pfeili* Ratz., (Coleopt. Ipidae), un element nou pentru fauna R.P.R. [***X. pfeili*, a new element in the Rumanian fauna.**] *Rev. Pădurilor* 70 (1), 1955 (45). 3 refs. [Rum.]

Found in the wood of *Alnus glutinosa*.

649. GYÖRFI, J. Vegyszeres cserebogárirtási kisérletek Sopronhorpácson. [**Experiments at Sopronhorpács on the chemical control of cockchafers.**] *Erdö* 3 (8), 1954 (273–5). [Hu.]

Spraying rows of trees with BHC at 0·32–1·2 g./m. proved more effective than dusting with DDT. The ♀ beetles showed greater resistance than the ♂, but the survivors became infertile.

650. SEDLMAYR, K. A sopronhorpácsi cserebogárírtási kisérletekhez. [**Cockchafer-control experiments at Sopronhorpács.**] *Erdö* 3 (8), 1954 (275). [Hu.]

Observation showed that fully grown beetles tend to take shelter in trees of shelterbelts, especially on Oak and Maple, where they are readily controlled by suitable chemical sprays.

651. SHENEFELT, R. D., LIEBIG, H. R., and DOSEN, R. C. **Protecting machine transplanted trees from white grubs.** *Tree Plant. Notes* No. 20, 1955 (14–7). 4 refs.

A simple sprayer device, designed to produce a spot distribution of insecticide on the roots of plants and the soil immediately around them, is illustrated and described. The apparatus is simple, inexpensive, can be used on any shoe-type planter and can be easily fixed or removed.

652. ***Oryctes rhinoceros* (L.) (Rhinoceros beetle).** *Distr. Maps Insect Pests* (*Ser. A*). No. 54, 1955. pp. [2]. [Commonwealth Institute of Entomology, London.]

Hymenoptera

See also Nos. 12, 90–7

653. BUCKNER, C. H. **Small mammals as predators of sawflies.** *Repr.* from *Canad. Ent.* 87 (3), 1955 (121–3). 10 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 196.)

Describes and discusses sampling work carried out in S.E. Manitoba with particular reference to difficulties of sampling technique.

654. BIRD, F. T. **Virus diseases of sawflies.** *Repr.* from *Canad. Ent.* 87 (3), 1955 (124–7). 12 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 197.)

A short summary of present knowledge.

655. THALENHORST, W. Zur Kenntnis der Fichten-Blattwespen. III Die Apparenzen der Diprionini. [**Spruce sawflies. III. The appearance in time of the Diprionini.**] *Z. PflKrankh.* 62 (6), 1955 (353–61). 12 refs. [G.e.] E.M.B.

Cf. *For. Abstr.* 15 (No. 3849).

656. ŽIVOJINOVIĆ, S. Obična borova zolja na Maljenu: istorijat gradacije i posledice golobrsta na crnom boru.[***Diprion pini* on Mt. Maljen: history of the outbreak and consequences of the defoliation of *Pinus nigra*.**] *Zašt. Bilja* No. 24, 1954 (3–19 + 4 plates). 8 refs. [Croat.e.] I.M.I.

The outbreak, the first to be recorded in Serbia, began in 1950, when second-generation larvae defoliated some 30 ha. of *P. nigra*, and in 1951 extended over 2000 ha. during the second generation, a considerable area being defoliated. In that year, hail in August killed many larvae, while parasitization of larvae and pupae by ichneumonids and tachinids, and of eggs by *Achrysocharella ruforum*, was high. After a whole year spent in diapause, imagos were observed in mid-June, 1953, and in August the second generation equalled that of 1951, larval feeding being observed on the whole area under *P. nigra* (though serious attack on *P. sylvestris* has been the exception) and presumably the build-up of population had not yet ended. Notes are included on chemical control measures [see *For. Abstr.* 16 (No. 729)] and on the results of the 1951 defoliation as seen in 1953. Many abnormal needles were produced in 1951–52 and there has been serious weakening of the defoliated trees, with loss of increment, reduced seed yields and high mortality. In 1952 and 1953 defoliated trees had respectively 29 and 16% of the foliage production, and 31 and 10% of the height growth, of undefoliated trees. Drought in 1952 aggravated the damage. In May 1953, 11,260 trees had to be removed, and by August many more moribund trees were to be seen. Populations of secondary pests, e.g. *Blastophagus minor*, *Pityophthorus glabratus*, *Pityogenes bidentatus*, *P. bistridentatus*, *Ips acuminatus*, *Pissodes notatus* and *P. pini*, have increased and are no doubt adding to the damage.

657. MAKSIMOVIĆ, M. Ciklus razvića obične borove zolje i njena masovna pojava na Maljenu 1951–1952 godine. [**The developmental cycle of *Diprion pini* and its mass appearance on Mt. Maljen in 1951–52.**] *Zašt. Bilja* No. 24, 1954 (20–40). 14 refs. [Croat.e.] I.M.I.

A report on the author's forest and laboratory observations, compared with and supplemented by data from literature, on the life history of the pest. The primary cause of the outbreak is believed to have been the poor condition of the forests, excessively opened by war-time fellings which left only the poorer trees standing, with consequent changes in microclimate and soil conditions.

658. **Pine sawflies.** *Leafl. For. Comm., Lond.* No. 35, 1955. pp. 8. Price 9*d*.

Notes on life history, damage, and control of *Diprion pini* and *Neodiprion sertifer*.

659. JUDD, W. W. ***Euura salicis-nodus* (Dalla Torre) (Hymenoptera: Tenthredinidae) and its hymenopterous parasites reared from spindle galls of Willow.** *Canad. Ent.* 86 (12), 1954 (542–6). 8 refs. O.R.S.

660. COPPEL, H. C. **Notes on the parasites of *Neodiprion nanulus* Schedl (Hymenoptera: Tenthredinidae).** *Canad. Ent.* 86 (4), 1954 (167–8). (*Contr. Div. Ent. Dep. Agric. Can.* No. 316.) O.R.S.

Lists species of parasites emerging from cocoons of *Neodiprion nanulus* collected near Belleville, Ont., in 1943 and 1944. The eulophid *Dahlbominus fuscipennis* was the most common, representing 75% of the total parasitization. The ichneumonid *Endasys subclavatus* was second in importance.

661. HEIMPEL, A. M. **Pathogenicity of a bacterium, *Serratia marcescens* Bizio., for insects.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 11 (3), 1955 (1).

Laboratory experiments indicated that this bacterium is pathogenic for *Neodiprion lecontei*, *N. banksianae*, and *Pristiphora erichsonii*, and less pathogenic for *N. swainei* and *Nematus ribesii*.

662. HEIMPEL, A. M. **A strain of *Bacillus cereus* Fr. and Fr. pathogenic for the Larch sawfly, *Pristiphora erichsonii* (Htg.).** *Canad. Ent.* 86 (2), 1954 (73–7). 13 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 103.) O.R.S.

During 1950 a strain of *Bacillus cereus* was isolated from dead and dying larvae of *Pristiphora erichsonii*. Both laboratory and field feeding tests confirmed that the bacterium is a pathogen of the sawfly. The possibility of using spore suspensions as a spray for control of the pest is being investigated.

663. HEIMPEL, A. M. **The pH in the gut and blood of the Larch sawfly, *Pristiphora erichsonii* (Htg.), and other insects with reference to the pathogenicity of *Bacillus cereus* Fr. and Fr.** *Canad. J. Zool.* 33 (2), 1955 (99–106). 7 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 192.) O.R.S.

In measurements on 11 species of Hymenoptera and 2 of Lepidoptera, the gut pH was found to change regionally during development and in different conditions, while the blood pH remained relatively unchanged. The pH in the gut and blood of the Larch sawfly was found to be close to the optimum for good growth of *B. cereus*. Similar results were obtained for other sawflies but not for the Lepidoptera examined. *From author's summary.*

664. MACLEOD, D. M., and HEIMPEL, A. M. **Fungal and bacterial pathogens of the Larch sawfly.** *Repr.* from *Canad. Ent.* 87 (3), 1955 (128–31). 14 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 198.)

A short summary of present knowledge.

665. MULDREW, J. A. **Parasites and insect predators of the Larch sawfly.** *Repr.* from *Canad. Ent.* 87 (3), 1955 (117–20). 9 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 195.)

Reviews the situation in Canada with respect to parasitization of the Larch sawfly and investigations made into the strain immune to *Mesoleius tenthredinis*, and discusses other parasites and insect predators and the relative value of these control factors.

666. COPPEL, H. C., and LEIUS, K. **History of the Larch sawfly with notes on origin and biology.** *Repr.* from *Canad. Ent.* 87 (3), 1955 (102–11). 64 refs. (*Contr. Div. Ent. Dep. Agric. Can.* No. 3285.)

At present in Canada *Pristiphora erichsonii* reacts in two different ways to parasitization by *Mesoleius tenthredinis*. In Manitoba and Saskatchewan the sawfly encapsulates ca. 100% of the parasitized eggs, whereas in British Columbia encapsulation rarely exceeds 4%. In order to throw light on the question of the possible existence of a native and an introduced species, or a combination of both, short reviews are presented of the taxonomic history of the sawfly, early records and history of infestations, possible sources of origin, biology, and morphology.

667. LEJEUNE, R. R. **Population ecology of the Larch sawfly.** *Repr.* from *Canad. Ent.* 87 (3), 1955 (111–7). 6 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 194.)

Presents brief notes on its life history, the principal factors affecting mortality and their interaction; explains the concept of life tables, reviews progress made in drawing them up for this species, and discusses their value.

668. SCHEDL, K. Die kleine Fichtenblattwespe (*Lygaeonematus pini* Retz.) verbunden mit einem Bericht über die in Kärnten in den Jahren 1950/51 aufgetretenen Forstschäden und deren Bekämpfung. **[*L. pini* [*Pristiphora abietina*], with a report on forest injuries and their control in Carinthia in 1950–51.]** Forstliche Bundesversuchsanstalt Mariabrunn. 1953. pp. 180 + 1 map + 2 tbls. 107 refs. [G.]

In two parts : (1) A monographic study of *P. abietina*, based partly on literature and partly on the author's observations, under the main heads: morphology and anatomy, life history, epidemiology (with special reference to factors favouring outbreaks and to natural enemies of the pest), significance for forestry, and prevention and control (with a section on control by power-dusting with DDT, DDT/BHC and BHC preparations, of which the last proved especially effective and economic, in 1951 in Carinthia, where damage had so far occurred only in pure Norway Spruce plantations). It is stressed that chemical control is an emergency measure and that what is required as a long-term solution to this and other pest problems, is to relinquish the planting of pure Spruce on unsuitable sites. (2) A report (pp. 141–180) on forest injuries and their control in Carinthia in 1950–51, including statistical data, and dealing with injuries of all kinds in nurseries, plantations and forest stands.

669. PAŞCOVSCHI, S. Un duşman al viespelor de gale. **[An enemy of the gall wasp.]** *Rev. Pădurilor* 70 (3), 1955 (142–3). [Rum.]

A note on the great spotted woodpecker (*Dendrocopus major*) as a predator of *Cynips hungarica*, a gall wasp attacking Oak.

670. WELLENSTEIN, G., and MÜLLER, H. Pflanzenbeschädigungen durch Waldameisen. Ein Beitrag zur Ernährung von *Formica rufa* L. **[Damage to plants by wood ants. The feeding habits of *F. rufa*.]**

Z. Weltforstwirt. 17 (2), 1954 (43–8). 44 refs. [G.e.f.]

A discussion, with some numerical data, of the useful and harmful effects of colonies of this ant, including aphis colonization and direct damage to buds and bark in early spring, concluding that the latter are outweighed by the former (mainly the destruction of insect pests).

Diptera

See also No. 98.

671. TRIPP, H. A. **Descriptions and habits of Cecidomyiidae (Diptera) from White Spruce cones.** *Canad. Ent.* 87 (6), 1955 (253–63). 16 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 212.) O.R.S.

Dasyneura canadensis, *D. rachiphaga* sp. nov., *Phytophaga carpophaga* sp. nov. and two unidentified larvae.

672. CONDRASHOFF, S. F. **Notes on the biology of a Douglas-Fir needle miner, *Contarinia* sp. [in British Columbia].** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 11 (3), 1955 (2–3).

673. JUDD, W. W. ***Phytophaga tumidosae* (Felt) (Diptera: Itonididae) and its hymenopterous parasites reared from the scarred gall of Willow.** *Canad. Ent.* 87 (6), 1955 (241–5). 5 refs. O.R.S.

674. KLEINSCHMIT, R. Schäden an Zapfen der Europäischen Lärche (*Larix decidua* Miller) durch die Lärchensamenfliege (*Chortophila laricicola* Karl.). **[Damage to cones of European Larch by *C. laricicola*.]** *Anz. Schädlingsk.* 28 (9), 1955 (129–31). [G.g.]

In over 2000 European Larch cones collected for a study of clonal variations, injury by *C. laricicola* was discovered. This manifested itself in a reduction in length and sometimes in diameter of the cones, in deformity of the scales and in decreased seed yield. The significance of this pest in seed orchards is discussed.

46. Damage to Tree Growth by Man

See also No. 1091.

675. BAADER, G. Unterschungen über Randschäden. **[Investigations into marginal injuries [sustained by forest stands].]** *SchrReihe forstl. Fak. Univ. Göttingen* No. 3, 1952, pp. 73. 4 refs. [G.]

The investigations, covering over 100 stand margins in Hesse, W. Germany, varying greatly in composition, age, site and aspect, and duration of exposure, aimed at ascertaining the effect of sudden lateral exposure on growing stock, increment, and soil condition, with a view to evaluating such damage for compensation claims. The number of trees and the length of boles classed as sound, $\frac{1}{3}$, $\frac{2}{3}$ or wholly diseased, and broken or thrown, were separately counted for successive strips (to a maximum of 7) of 10 m. depth, usually on a front of 100 m. An injury index was calculated by multiplying the % of damaged bole-length per affected strip by the number of strips affected. Diameter increments of sample trees in strips 1, 3, and 6 or 7 were measured, and similarly, for conifers only, the height growth for the period of exposure. A comparison of the height quality class to which each strip belonged at the time of exposure and at the time of investigation was then made, and finally effects on the soil were ranged in 5 classes for extent of grass and weed invasion, and impoverishment. While aspect and duration of exposure were everywhere important factors, age seemed the decisive factor for Spruce, where the age classes up to 40 years suffered most from bark scorch followed by *Fomes annosus* rot, those of 40–70 from barkbeetles, and those over 70 from wholesale windthrow. With Beech, and to a lesser extent with mixtures, site quality seemed the most important factor. Beech of the first quality on basalt and Lower Permian sandstone showed bark scorch early, with subsequent exposure of the wood and rapid and severe fungus infection (chiefly *Polyporus adustus*, *P. squamosus*, *P. fomentarius* and *Pleurotus ostreatus*) resulting in breakages, and frequently in a total loss of the outer margin of the stand within 2 years. On poorer sites (e.g. bunter sandstone, graywacke, clay slate and diluvial sand) bark damage was usually restricted to the butt, and fungus infection was rare, damage moving in from the stand margin at a rate of 0·8 m./ year against 2·6 m./year on the better sites; but soil deterioration and top drying was more severe. With Oak, whether pure or in mixture, top drying and epicormics occurred more frequently on better sites. Spruce, in mixtures, usually suffered more than hardwoods. Pine suffered no direct injuries.

Average loss of height increment for S. and S.W. aspects is estimated at $\frac{7}{10}$ of a height class to a depth of 70 m. for Spruce, $\frac{1}{2}$ of a class to a depth of 60 m. for Pine, $\frac{6}{10}$, and $\frac{8}{10}$ respectively for Beech on basalt and on clay slate, and $\frac{4}{10}$ for Oak. There were small compensating increases in diameter m.a.i's. Value losses of growing stock are estimated at from 70 to 50% for Spruce, 54 to 14 for Beech according to site and diameter class, and 45 to 20 for Oak. No suitable countermeasures are suggested but, in the absence of barkbeetle infestations, it is considered better to leave the diseased trees as long as possible, rather than salvage them at an early stage of deterioration and expose others. Mulching with brushwood to a distance of 30 to 50 m. is advised against soil deterioration.

676. STEINBRENNER, E. C., and GESSEL, S. P. **The effect of tractor logging on physical properties of some forest soils in southwestern Washington.** *Proc. Soil Sci. Soc. Amer.* 19 (3), 1955 (372–6). 9 refs. O.R.E.

Soil samples taken on 9 recently tractor-logged areas and adjacent undisturbed land bearing mature Douglas Fir, revealed that the loss in permeability averaged 93% on skid roads (26% of the area) and 35% on the rest of the cut-over areas, the increase in bulk density 15% and 2·4%, and the decrease in macroscopic pore space 53% and 10% respectively (all in % of corresponding figures for undisturbed areas); results varied, however, considerably from area to area. [Cf. *For. Abstr.* 16 (No. 2020).]

48. Injuries Due to Unknown or Complex Causes

677. STONE, E. C. **Poor survival and the physiological condition of planting stock.** *For. Sci.* 1 (2), 1955 (90–4). 5 refs.

Cf. *For. Abstr.* 16 (No. 4354).

5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

See also Nos. 282, 728.

678. WECK, J. Forstliche Hilfstabellen zur Abschätzung von Waldbeständen. [**Auxiliary mensurational tables for forest stands.**] Neumann Verlag, Radebeul and Berlin. 2nd ed. (rev.), 1954. pp. 32. [G.]

Contains tables or graphs, with explanatory notes, for estimating: (1) Timber volume [*Derbholz*, i.e. timber down to 7 cm. top diam.] per ha. in even-aged pure stands, from mean height and age (Scots Pine, Norway Spruce, Douglas Fir, Beech). (2) Volume/ha. in young (< 40-year) pure stands, from 'absolute height quality-class' (a.h.q.) [see (3)] and age class (Pine, Spruce, Beech). (3) Site quality ('a.h.q.') based on mean height of even-aged pure stands at 100 years. This section includes (*a*) a table of mean heights at 100 years, with figures for total dry weight of *Derbholz* produced up to that age (Birch; Larch, Alder, Ash; Spruce, Pine, Douglas; Silver Fir, Beech; Oak), and a table of density factors for converting dry weight to green volume for the calculation of the m.a.i. corresponding to the a.h.q.; (*b*) graphs for assessing a.h.q. of even-aged stands at ages other than 100 (Pine, Spruce, Beech, Oak); (*c*) comparison of a.h.q. with relative quality classes expressed both as m.a.i. to age 100 and in the conventional yield-table classes (Spruce, Pine, Beech); and (*d*) a.h.q. from trees > 140 years old (e.g. standards over young high forest, or the tallest class in selection forest) of specified diam. classes (Pine, Spruce or Beech). (4) % distribution of diam. classes in the standing volume of even-aged woods. (5) Distribution of the chief assortments in % of total *Derbholz*, from a.h.q. and rotation, for normal felling series (Pine, Spruce, Beech, Oak). (6) C.a.i. according to age classes and a.h.q. (Pine, Spruce, Beech). (7) C.a.i. from the increment % (Schneider's formula) as determined on increment cores (Beech, Oak, Spruce, Pine). (8) Standing volume of individual trees, from d.b.h. and total height. (9) Stumpwood in % of *Derbholz* volume (Pine, Spruce, Beech); bark % (Pine, Spruce, Beech, Oak); small wood in % of *Derbholz* (Spruce, Pine, Beech, Oak, Alder). (10) Factors for converting old German provincial measures to metric units. An appendix briefly describes the rapid method of stand measurement based on Köhler's mean tree-spacing method. [Cf. *For. Abstr.* 15 (Nos. 3883–4).]

51. Systems and Units of Measurement

679. WILSON, S. E. **The Hoppus system. I. Hoppus through the ages. II. Origin of Hoppus system. III. Rules for measuring round timber. Their derivation and application.** *Timb. Tr. J.* 214 (4117; 4119; 4121), 1955 (88–9; 87–8; 84–5).

52. Measurements of Stem Dimensions and Volume of Trees, Stands, Forests and Timber

680. GIORDANO, G. Manuale pratico di cubatura dei legnami e dei soprassuoli boschivi. [**A practical handbook of timber and stand volume measurement.**] Ulrico Hoepli, Milan. 2nd ed. (rev.) 1953. pp. 251. [It.] Price [13*s.* 6*d.*].

In addition to ordinary volume tables, includes taper and form-factor tables, bark-volume, volume of coppice, and assortment tables for planks, squared timbers, sleepers, staves, charcoal etc., with worked examples of their use.

521. Diameter (Girth) and Sectional Area

See also No. 698.

681. HAMPF, F. E. **Relationship of stump diameter to d.b.h. for Yellow Birch [*Betula lutea*] in the northeast.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 45, 1955. pp. 2 + 1 gph.

A graph is given based on the equation: d.b.h. = 0·776 (stump diam. u.b.) + 2·108 (stump height) − 1·579. Data used are from measurements on 468 stumps.

682. HAMPF, F. E. **Relationship of stump diameter to d.b.h. for Northern Red Oak [*Quercus borealis*] in the northeast.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 46, 1955. pp. 2 + 1 gph.

Diameter measurements of 1240 stumps have been used to develop an equation: d.b.h. = 0·739 (stump diam. u.b.) + 2·072 (stump height) − 0·773, and the relationships obtained are given in a graph.

683 QUIGLEY, K. L. **Ohio's timber harvest revealed in stumps.** *For. Surv. Release Cent. St. For. Exp. Sta.* No. 18, 1955. pp. 12.

The method already described [see *For. Abstr.* 16 (No 744)] was used in a survey in Ohio in 1951–53. Results are discussed and tabulated, to show: timber cut by species and tree-size class, timber cut by product, average annual volume cut by d.b.h., region, and species (%), and average volume cut per acre by region. The reliability of the data is assessed.

523. Bark

See also No. 690.

684. DORIN, T. Proporția cojii la sălcii. [**Bark volume of Willows.**] *Rev. Pădurilor* 70 (1), 1955 (15–22). 8 refs. [Rum.]

Gives tables from Rumanian data of (1) bark volume in cu. dm., (2) bark in % of stem volume, (3) height to which bark can be stripped for different diameters, for *Salix alba*, *S. caprea*, *S. fragilis*, *S. rubens*, *S. silesiaca* and *S. subcaprea*. Willow bark is used for tannin extraction.

524. Determination of the Volume of Trees and Stands

524.1. Principles of Volume Determination. Form (Taper)

See also Nos. 691–4, 731.

685. GROSENBAUGH, L. R. **New tree-measurement concepts: height accumulation, giant tree, taper**

and shape. *Occ. Pap. Sth. For. Exp. Sta.* No. 134, 1954. pp. 32. 12 refs.

The new concept developed by the author consists in selecting tree diameters above breast height in diminishing arithmetic progression: tree height to each diameter is estimated, recorded and accumulated. The use of these data in calculating volume and surface area of individual trees is illustrated, and mechanical methods of recording and calculating the data are discussed. A 'giant-tree' table gives cumulative surface and volume figures for a peeled log or tree standing on a 50-in. base and tapering up for 400 ft. at the rate of $\frac{1}{8}$ in./ft. Examples of its use are given.

686. **[Form of *Agathis alba*.]** *Rep. For. Dep. Sarawak 1954*, 1955 (15).

A girth-volume table, based on a table (diam. × height = volume) for similar sites in Indonesia, was prepared for *A. alba* on lowland podzol soils. A large number of trees were measured for timber height, and it was found that there is no girth/height correlation once the trees have attained a girth of about 48 in. The average timber height of such trees was therefore taken as a constant. The form factor is high in young trees of this species, but low in old trees.

687. GIURGIU, V. Studiul indicilor de formă la molidul din R.P.R. prin metodele statisticii variabile. **[The study of the form quotient of *Picea abies* in Rumania by the method of variance analysis.]** *Rev. Pădurilor* 70 (6), 1955 (264–9). 4 refs. [Rum.]

The mean value of the form quotient for Spruce in Rumania is 0·666, and the coefficient of variation for this quotient is ± 8·7%.

688. ANDERSEN, H. E. **Girard form class comparisons for three major species in Southeast Alaska.** *Tech. Note Alaska For. Res. Cent.* No. 26, 1955. pp. 2. 1 ref.

The average form class (% ratio of diam. u.b. at the top of the first 16- or 32-ft. log and d.b.h. over bark) of Sitka Spruce and Western Hemlock was respectively 76·4 and 75·8 for 32-ft. logs and 82·4 and 82·2 for 16-ft. logs.; the difference between the species is not significant for either subclimax sawtimber or climax pulp-timber, and their mean may be considered as 76 for 32-ft. and 82 for 16-ft. logs. The average form class of Western Red Cedar, based on only 46 trees, was 65 for 32-ft. and 75 for 16-ft. logs; trees of smaller diam. (12–22 in.) tended to have a higher form class than those of larger diam. but more data are needed to establish this definitely. There are indications, however, that height growth of Western Red Cedar in S.E. Alaska may reach a maximum relatively early. A linear or near-linear relation was found between form classes of 16- and 32-ft. logs.

689. KOSONOGOV, P.; MIRKOVIĆ, D. Istraživanja oblika i zapremine belog jasena u Ravnom Sremu. **[Investigations on the form and volume of *Fraxinus excelsior* on the plains of Srem.]** Povodom članka inž. Kosonogova: Istraživanje oblika i zapremine belog jasena u Ravnom Sremu. **[On Kosonogov's paper 'Investigations on the form and volume of *F. excelsior* on the plains of Srem'.]** *Šumarstvo* 8 (6), 1955 (344–69). 14 refs. [Serb.]

The first author supplements Mirkovic's paper [see *For. Abstr.* 15 (No. 1633)] with details relating to the preparation of tables (arrangement of data, calculations etc.). The second disputes some of Kosonogov's arguments.

524.3. Volume of Tree Groups and Stands

See also Nos. 685–6, 698, 725–6.

690. PATRONE, G. Tavola cormometrica dell' abete rosso di Paneveggio. **[Volume table for *Picea abies* from the forest of Paneveggio (Trento).]** *Ital. for. mont.* 10 (3), 1955 (130–5). [It.]

Gives double-entry (height and d.b.h.) and single-entry (d.b.h. alone) tables, and a graph showing amount of bark in % of stem wood.

691. DUFF, G., and BURSTALL, S. W. **Combined taper and volume tables for *Pinus radiata*.** *N.Z. For. Res. Notes* No. 1, 1955. pp. 72.

Combined taper and volume tables for New Zealand-grown *P. radiata* are presented for each of 4 conservancies (3 for unthinned and 1 for a thinned stand). Each set includes tables showing cumulative volumes in cu. ft. and diameter (u.b.) at stated heights above ground, total stem volumes, and merchantable volumes to stated top diameters (u.b.) for 1-in. d.b.h. classes and 10-ft. total height classes. *From authors' summary.*

692. ANDERSEN, H. E. **Preliminary Western Redcedar [*Thuja plicata*] cubic form class volume tables for Southeast Alaska.** *Tech. Note Alaska For. Res. Cent.* No. 28, 1955. pp. 1 + 10 tbls.

Tables show, for 10 form classes (66–86), gross cu. ft. volume u.b. for trees of diam. 8–46 in. containing one to six 16-ft. logs up to 6-in. top.

693. ANDERSEN, H. E. **Extension of board foot form-class volume tables for Western Redcedar.** *Tech. Note Alaska For. Res. Cent.* No. 27, 1955. pp. 2. 1 ref.

Gives tables showing, for form classes 56, 58, 60 and 62, bd. ft. volumes for trees of d.b.h. ranging from 14 to 64 in. and containing one to three 32-ft. logs.

694. LESTER, D. T., and YOUNG, H. E. **Hemlock [*Tsuga canadensis*] form class volume tables (central and southern Maine).** *Tech. Note Univ. Me. For. Dep.* No. 35, 1955. pp. 2. 3 refs.

Gives tables showing the bd. ft. volume (Maine log rule) for 1·0 to 3·5 merchantable logs with d.b.h. ranging from 10 to 24 in., in 5 Girard form classes.

695. WECK, J. Vorratsermittlung durch Abstandsmessung. **[Ascertaining growing stock by measuring spacings of trees.]** *Z. Weltforstwirt.* 18 (1), 1955 (24). 2 refs. [G.]

For a single-storeyed stand, the radii of circles having areas of 1, 2, 3, 4 . . . times the mean growing space per tree will be related as $\sqrt{1} : \sqrt{2} : \sqrt{3} : \sqrt{4} \ldots$; and if r_1 is the radius correspondng to the mean growing space per tree, the mean spacing

$e = r_1 \sqrt{\pi}$. These relationships enable e to be calculated in terms of the mean distance from a tree to the first, second and third nearest trees (e_1, e_2, e_3) as $e = \frac{e_1}{0{\cdot}681} = \frac{e_2}{0{\cdot}888} = \frac{e_3}{1{\cdot}053}$.

Köhler's empirical method gives a slightly smaller value for e, i.e. overestimates the number of trees/ha., though in practice this error tends to be compensated through measuring tapes not being held quite taut or horizontal.

Using the above formula, the exact measurement of a sufficient number of any one of the values e_1, e_2 or e_3 should considerably simplify procedure without loss of accuracy as compared with Köhler's method. It is suggested that measurement of e_3 may be the best practical compromise between high accuracy and high measuring costs. [Cf. *For. Abstr.* 15 (3883–4).]

524.6. General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

696. SEELY, H. E. **A forest survey method.** *Tech. Note For. Br. Can.* No. 8, 1955. pp. 15. 10 refs.

The method described, which has been used successfully in Quebec, Yukon, Newfoundland and Nova Scotia, is a combination of air and ground work. The first step is the classification or 'stratification' of the forest stands by the aerial-photo interpreter on the basis of height (up to 30 ft., 31–50 ft., 51–70 ft., 71–100 ft.), type (up to 25% hardwoods, 26–75% hardwoods, 76–100% hardwoods), canopy density (up to 30%, 31–50%, 51–70%, 71–100%), and site (well drained bottom lands, moderate slopes and bench lands, steep slopes, poorly drained flats, hilltops and ridges). Next comes the preparation of a provisional map showing all stands of the stratification delineated and marked with the appropriate symbols. The provisional map is taken to the field, and sample plots are measured in sufficient numbers to provide adequate samples of the various strata. The plot data are computed in the office and are used to correct the original photo interpretation where necessary. The provisional map is then revised, the final map drawn, map areas are planimetered, and timber estimates prepared. The method is characterized by the avoidance of subjective alterations, in field or office, of the stratification of the forest stands prepared by the aerial-photo interpreter. The stratification is done directly from the aerial photographs and depends largely on the experienced interpreter's ability to distinguish differences in such values as height of stand, forest type, and canopy density. His estimates of these values may be high or low but, if they are consistent, they do not prevent the satisfactory application of the sample-plot data to the stratification. Re-interpretation of the stratification is not done until the plot data have been computed and are available for use in a general and consistent raising or lowering of the stratification values if and when necessary. An example is given of the stratum volume tables used in computing timber quantities.

697. SETH, S. K. **Sampling and assessment of forest crops.** *Bull. U.P. For. Dep.* No. 21, 1955. pp. 55 + 3 dgms.

The first part of the bulletin deals with the conduct of partial enumerations of growing stock, and was originally compiled for inclusion in the revised version of the Uttar Pradesh Working Plan Code. The second part deals with sampling procedures for regeneration surveys.

698. HUSCH, B. **Results of an investigation of the variable plot method of cruising.** *J. For.* 53 (8), 1955 (570–4). 14 refs.

Forty acres consisting of a scattered over-storey of overmature conifers above younger hardwoods with bd.ft./acre volumes varying from negligible to 50,000, were divided into 4 ten-acre tracts, and 100 plot centres were established at 2-chain intervals (25 per tract). Each tract was then cruised by Bitterlich's variable plot method [see *For. Abstr.* 10 (No. 1473)] to test the critical angles of 52·09, 104·18 and 208·38 minutes. It was found that some plot centres could not be used owing to plots overlapping. To avoid this, the minimum distance between plot centres must be twice the maximum distance (D), from the plot centre, of the largest diameter that would cause a tree to be included. This is got from $D = \frac{r}{12 \tan \frac{a}{2}}$ where r is the radius of the largest tree in inches and a the critical angle. The minimum distance of plot centre from tract edge should be D. These limitations reduced the available centres over the 40 acres to 9 and 78 for the 2 smaller critical angles with various approximations to one-quarter of these for the 10-acre tracts. The estimated diameter of the largest tree was 36 in., which gave 2 D = 6, 3 and 2 chains respectively for the 3 angles. (The 4 tracts were completely enumerated for control.) A table was made of bd. ft. volumes per sq. ft. basal area by species groups and diameter classes, and b.a. was translated thus into bd. ft./acre. Tables show the deviations from the 100% tally of b.a. and volume for the whole area and each 10-acre tract for the three critical angles, and a graph shows time taken against b.a./acre for each angle. The angle of 208·38 minutes was the most accurate and took the least time in the plot, the greater accuracy being due probably to the greater number and smaller size of the plots. Owing to the greater number of plots and travelling between them, this angle took a little less than twice as long as the smallest angle but the added accuracy (− 4·6 and − 7·6% for b.a. and vol. of the whole area against − 47·8 and − 47·5%) indicates its superiority. The middle angle was second in accuracy but the most time-consuming.

699. LOMBARD, F. Un procédé d'inventaire rapide des peuplements par dénombrements sommaires. **[A rapid method of making forest inventories by partial enumerations.]** *Rev. for. franç.* 7 (8), 1955 (589–94). [F.]

An article written in 1939, describing a method of partial enumeration carried out by 4–5 men, 25 m. apart, progressing through a stand, and stopping

every 100–120 m. to enumerate the trees within a radius of 10 m. of each.

700. LØSET, O., and STRAND, L. **Blindforsøk i gran- og furuforyngelser. [Uniformity trials in young stands of Scots Pine and Norway Spruce.]** *Tidsskr. Skogbr.* 63 (2 (5)), 1955 (214–27). 2 refs. [Nor.nor.e.]

A study was made of the effect of variation in shape and size of plot and of division into blocks, on results of height measurements. It was found that: (1) long narrow plots give greater accuracy than squarer ones; (2) for the same total area, greater accuracy is obtained with increasing number of replications; (3) Latin squares seem to give no greater accuracy than randomized blocks; and (4) no correlation exists between block shape and block variance. Graphs, tables and diagrams have English legends.

525. Volume by Assortments. Merchantable Volume

See also Nos. 683, 692–4.

701. ANTONIOTTI, G. B. **Tavola dendrometrica del faggio del Molise cresciuto in fustaia coetanea. [Volume table for Beech in Molise, grown in even-aged stands.]** *Ital. for. mont.* 10 (4), 1955 (156–8). [It.]

Single-entry assortment tables. [Cf. *For. Abstr.* 12 (No. 1626).]

526. Log Measurement. Scaling

702. BRANTSEG, A. **Nye tømmerundersøkelser i Nord-Trøndelag. [New investigations on logs in N. Trøndelag.]** *Medd. norske Skogforsøksv.* 13 (1) (No. 44), 1954 (89–127). 12 refs. [Nor.nor.e.]

On the basis of measurements of 5146 logs, new volume tables have been prepared for Norway Spruce with top-diam. measurements of 12–36 cm. u.b. and lengths of 3½ to 8 m. The new table shows rather smaller volumes than those of a similar table made in 1922. A study of defects and injuries in the measured timber showed that bad pruning and barking may cause an error of 14·6%.

703. BRANTSEG, A. **Kubikk- og stykkepristabell for furu på Sørlandet. [Volume and standard price tables for Scots Pine in S. Norway.]** *Medd. norske Skogforsøksv.* 13 (1) (No. 44), 1954 (129–63). 19 refs. [Nor.nor.e.]

53. Special Measurements of Trees and Stands (Crown Dimensions, Stand Density etc.)

See Nos. 685, 695, 725–6.

54. Assessment of Site Quality

See also Nos. 716, 725.

704. SEIBERT, P. **Zur Ertragsleistung einiger Kiefern-Forstgesellschaften in Schlitz. [The site quality of some Pine-plantation communities in Schlitz.]** *Mitt. florist.-soziol. Arbeitsgemeinsch. (n.s.)* No. 4, 1953 (160–2). 3 refs. [G.g.]

Satisfactory agreement is found between the ground-vegetation types of 70 plots in Scots Pine plantations (in the *Fagetum luzuletosum* region, on soils over bunter sandstone) and conventional site quality classes previously assessed for the same areas. Statistical dispersion of values was least for certain types that are sharply distinguished by differential species.

705. FORRISTAL, F. F., and GESSEL, S. P. **Soil properties related to forest cover type and productivity on the Lee Forest, Snohomish County, Washington.** *Proc. Soil Sci. Soc. Amer.* 19 (3), 1953 (384–9). 12 refs. O.R.E.

Mechanical and chemical properties of the forest floor and soil, and soil moisture content were examined for 5 plots stocked respectively with *Pseudotsuga taxifolia*, *Tsuga heterophylla*, *Thuja plicata* and *Alnus rubra*, for each of which site class, number of trees, b.a., and volume and growth per acre were determined. Depth to hardpan layer was an important criterion for productivity rating. The dominating influence seemed to be soil drainage.

706. LEMMON, P. E., JOHNSON, R. A., and KRAUTER, O. W. **Site index curves for Lodgepole Pine in the pumice area of Central Oregon.** *J. For.* 53 (8), 1955 (553–5). 5 refs.

Based on 170 whole-length and 140 sectional heights from 35 plots, the paper gives for unmanaged natural stands of *Pinus contorta* var. *latifolia* a mean height-growth curve (dominants and codominants; 10–130 years), a site-index table showing mean total height and corresponding age by 10-year intervals for each of 9 site qualities, and the 9 site-index curves (reference year 80).

707. STONE, E. L., and AIRD, P. L. **Site index curves for European Larch [under American conditions.]** *New York Forester* 10 (4), 1955 (10).

An attempt to use U.K. Forestry Commission curves showed that, below the age of 35, the height of many New York plantations greatly exceeded the British site I, and that very few fell within site classes IV and V. Curves have therefore been derived for New York and southern New England, using basic data from 147 plots.

708. HEINSELMAN, M. L., and ZASADA, Z. A. **A review of literature relating to Quaking Aspen [*Populus tremuloides*] sites.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 32, 1955. pp. 61. 92 refs.

Summarizes available data for Minnesota.

709. GRAHAM, S. A., and HARRISON, R. P. **Site identification for Bigtooth Aspen sucker stands.** *Mich. For.* No. 10, 1955. pp. 4.

Tabulates site-quality data for *Populus grandidentata* on well-drained sandy soils, expressed as total height at 30 years, which varies from 30 ft. on the poorest to over 90 ft. on the best sites.

710. WEITZMAN, S., and TRIMBLE, G. R., JR. **A capability classification for forest land.** *J. Soil Wat. Conserv.* 10 (5), 1955 (228–32). 2 refs.

The authors propose 4 site classes for hardwoods in the northern Appalacanhis, based on a study of Oak sites. The factors used in evaluating site quality are aspect, topographic position, steepness of slope, and depth of soil. The type and intensity of management suited to each class is suggested.

56. Increment. Development and Structure of Stands

See also Nos. 200–1, 207, 209, 339, 378, 408, 411–6, 422, 518, 675, 732.

711. WECK, J. Vergleich von Wachstumsgang und Ertrag von Nadelholzreinbeständen in Grossbritannien, Dänemark, Süd- und Norddeutschland. **[Comparison of growth and yield of pure coniferous stands in Gt. Britain, Denmark, and S. and N. Germany.]** *Z. Weltforstwirt.* 17 (2), 1954 (41–3). [G.e.f.]

Basing his analysis on the revised yield tables for conifers of the U.K. Forestry Commission [see *For. Abstr.* 15 (No. 2758)], C. M. Møller's latest figures for *Picea abies* in Denmark [see *For. Abstr.* 16 (No. 780)], and, for Germany, tables by Wiedemann, Schober, and Zimmerle, the author compares, *inter alia*, height growth, total yield and m.a.i., for comparable site classes of *Larix decidua*, and *L. leptolepis*, *Picea abies*, *Pinus sylvestris* and *Pseudotsuga taxifolia*. British figures, except for *L. decidua*, are superior to the German in most respects, with Danish figures for Spruce intermediate. While climatic differences are considered responsible for the better results from Britain, trials with Scottish strains of Pine are recommended for German coastal regions.

712. DUMITRESCU, S. N. Contribuţii la cunoaşterea laricelui in R.P.R. **[Larch in Rumania.]** *Rev. Pădurilor* 70 (4; 5), 1955 (159–63; 227–32). 7 refs. [Rum.]

Gives data on yield, increment, and physical and mechanical properties of *Larix decidua* wood derived from felling operations in the Sinaia Forest Circle in 1954. Data on Spruce, Silver Fir and Beech from the same stand are given for comparative purposes.

713. VINCENT, A. B. **Development of a Balsam Fir and White Spruce forest in Northwestern New Brunswick.** *Tech. Note For. Br. Can.* No. 6, 1955. pp. 27 + map. 5 refs.

A study was made, as part of the Green River Project, of increment and reproduction on some 4000 acres of mixed *Abies balsamea* and *Picea glauca*. Permanent sample plots were established in 1945, and remeasurement in 1950 showed that the net merchantable volume increment averaged 34 cu. ft./acre/year, that mortality and windfall were serious in most types, and that diameter growth had risen during the period. Reproduction was inadequate on ca. 21% of the plots in the types studied, and ca. half of this deficiency was considered to be due to the dense thickets of Mountain Maple [*Acer spicatum*] prevalent in the area.

714. SMITH, L. F. **Development of second-growth Longleaf Pine in South Mississippi.** *J. For.* 53 (9), 1955 (648–9).

Gives data at more or less 5-year intervals (13th to 42nd year) of stem number, mean d.b.h., b.a., and cords/acre for that part of the stand ⩾ 3·5 in. d.b.h., with a table of increment and mortality. Longleaf Pine should be thinned at 25 years to 400 stems/acre, and thereafter at 5- to 10-year intervals. Here thinnings were delayed until the 36th year; production averaged one cord/acre/year. The site index was 80 (ft. in 50 years).

715. PAVARI, A. Sul trattamento delle fustaie di pino domestico (*Pinus pinea* L.). **[The management of *P. pinea* stands.]** *Repr.* from *Atti del Congresso Nazionale di Selvicoltura, Firenze 1954*, 1955 (69–97 + 4 photos). [It.]

Gives data on increment, yield, and stand structure of both even-aged and uneven-aged stands in Italy, Spain, and Turkey.

716. ERTELD, W. Ertragskundliche Merkmale einiger norddeutscher Kiefernwaldgebiete. **[Yield characteristics of some North German Pine forest regions.]** *Arch. Forstw.* 3 (5/6), 1954 (432–40). [G.]

Using 56 sample plots from 17 research series with long records and ca. 320 stands measured in 17 different forest associations, grouped in 3 climatic regions, stretching from Mecklenburg to the Saxony Anhalt, the mean deviation per decade from the height-growth curve of Wiedeman's Scots Pine table 1943 [cf. *For. Abstr.* 12 (No. 1634)] is shown in a histogram for each research series. These means are then grouped for each region and the different years in which the deviations are initiated are shown in graphs. A comparison is also made to contrast the effect of light thinnings (*Durchforstung*) with open-stand thinnings (*Lichtung*) in the 3 regions. The distinct advantage of the latter in the drier region is ascribed to more rain reaching the soil. For the 320 forest-association stands the quality class in tenths is plotted. High correlations are shown within each region between quality class and association, but wide inter-regional differences occur in the same association. The coefficient of variation within an association in a single region is high only in the Pine/mixed forest and particularly so in the 'devastation' types (heath, lichen, and *Vaccinium*) and here the ground flora is an unreliable indicator of site. A study of the structure and of variations in the current timber volume increment in untended stands brought out yet other differences in the 3 regions. Because of these differences in height performance, in the course of growth in the associations, and in reaction to thinning, the author rejects methods of yield-table construction based on single factors such as forest region, growth regions, and site. Growth curves should be established so typical of individual site classes as to give the greatest possible accuracy in individual applications; how these curves are worked up into yield tables is of secondary importance. More must be learned first of the interrelation of forest region, site, yield, and course of growth.

717. PARASCAN, D., and MIRZA, D. *Pseudotsuga taxifolia* Britt. cultivată la Cacica. **[*P. taxifolia* grown at Cacica [in Bukovina].]** *Rev. Pădurilor* 70 (3), 1955 (98–101). 5 refs. [Rum.]

A stem analysis of a 50-year-old Douglas Fir compared with that of a Silver Fir of the same age growing near by. The Douglas Fir was superior in height, diameter and volume increment at all ages.

718. POSKIN, A. Accroissements annuels en circonférence de peupliers de culture en Belgique. [**Annual girth increment of Poplars grown in Belgium.**] *Spec. Pap. 8th Sess. int. Poplar Comm., Madrid 1955* No. *FAO/CIP* 75-*D Add.* 1, 1955 (93–6). [F.]

Tabulates girth-increment data for 15 years, for *Populus virginiana*, × *P. robusta*, × *P. regenerata*, × *P. serotina*, and × *P. marilandica*. [Cf. *For. Abstr.* 14 (No. 551).]

561. Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology

See also No. 800.

719. GLOCK, W. S. **Tree growth and rainfall.** *Trans. Amer. geophys. Union* 36 (2), 1955 (315–8). 10 refs. H.S.B.

Outlines briefly two methods of approaching the problem of estimating rainfall from tree growth: (1) an analysis of growth patterns giving a general picture of the rainfall regime under which the trees grow, and (2) determination of changes in the moisture supply to individual trees by studying variations among the growth-ring sequences. An example is presented of the latter type of study, made in New Mexico.

720. ERMICH, K. Zależność przyrostu drzew w Tatrach od wahań klimatycznych. [**The dependence of diameter growth of trees in the Tatra mountains on climatic fluctuations.**] *Acta Soc. Bot. Polon.* 24 (2), 1955 (245–73). 28 refs. [Pol.e.] O.B.D.

Presents the results of investigations into the diameter growth of Fir, Spruce and Larch in relation to temperature, atmospheric humidity, precipitation and exposure. *From author's summary.*

562. Volume Increment

See No. 733.

564. Forecasting Increment

721. LYNCH, D. W. **Growth of young Ponderosa Pine stands in the Inland Empire.** *Res. Pap. Intermt. For. Range Exp. Sta.* No. 36, 1954. pp. 16. 3 refs.

Tables are given, based on measurements of 5000 trees, showing future 10-year volume growth in cu. ft. for trees of different age and d.b.h. on sites II; III, IV and V; and VI. To use the tables, a stand table is needed showing the number of trees by 1-in. diameter classes. The age of the stand should be determined by boring a representative group of dominants and codominants. The method gives results much closer to actual growth determined from increment-core and bark measurements, than those from normal yield-table data. Other tables include data on mortality on all sites in a 10-year period, by age and stocking classes, number of cords of stacked wood per 100 cu. ft. of total tree volume, total cu.-ft. volume per tree by d.b.h. classes and site groups, and ratios of International and Scribner bd.-ft. volumes to cu.-ft. volumes by diameter classes.

566. Yield Tables and Their Construction

722. ELIASSEN, P.-A. Om produksjon i plantet granskog i Namdalen. [**Yield in Spruce plantations in Namdalen [Trøndelag].**] *Tidsskr. Skogbr.* 63 (2 (5)), 1955 (209–13). 2 refs. [Nor.]

Measurements on 72 plots in 30- to 32-year-old and 11 plots in 40-year-old planted Spruce showed that, for the same site classes, their productivity (number of trees, height increment and basal area) approximated to that of Spruce yield tables for E. Norway.

723. FERGUSON, J. H. A. Tabel-tegakan untuk *Pinus merkusii*. [**Yield table for *P. merkusii*.**] *Spec. Publ. For. Res. Inst., Bogor* No. 9, 1955. pp. 7. [Jav.]

A translated summary of *Commun. For. Res. Inst., Bogor* No. 43, 1954. [See *For. Abstr.* 16 (No. 2062).]

58. Surveying and Mapping Aerial Surveys

585/588. Aerial Reconnaissance and Survey

See also Nos. 252, 642, 696

724. HAGAR, R. K., and NAGY, W. **A method of determining scale of vertical aerial photos.** *J. For.* 53 (8), 1955 (588–9). 2 refs.

The method depends on measuring area instead of linear distance, the representative fraction being the $\sqrt{}$ of the photo area divided by the $\sqrt{}$ of the ground area, stated in the same units. This scale holds true for the average elevation of the area. Applicability depends on accurate knowledge of the ground area e.g. of a 'town' [up to 40 sq. miles in the U.S. Cadastral Survey] with boundaries identifiable on the photos. Local scale within this area can be adjusted if a contoured map e.g. of the U.S. Geological Survey is available. The method is claimed to be easily and rapidly applied. An example is assumed of a town of 11,600 acres covered by 6 overlapping photos, for which the steps are detailed.

725. WILSON, A. K. **Delineating Ponderosa Pine volume and site quality classes from aerial photographs.** *Res. Pap. Intermt. For. Range Exp. Sta.* No. 34, 1954. pp. 10. 2 refs.

In the experiment described, aerial photographs were successfully used in stratifying certain areas of the Boise Basin Experimental Forest, Idaho, supporting virgin Ponderosa Pine, into 3 volume-per-acre classes and then delineating 16 compartments of at least 30 acres, each of which met the volume-class requirement. The volume classes were found from height/diameter measurements on sample trees, to correspond with medium and good site class IV, and medium site class III. Stereograms are presented showing the appearance of Ponderosa Pine stands ranging in average volume from 9·2 to 34·7 thousand bd. ft./ acre.

726. GINGRICH, S. F., and MEYER, H. A. **Construction of an aerial stand volume table for upland Oak.** *For. Sci.* 1 (2), 1955 (140–7). 7 refs.

Ninety-three 0·2-acre plots, randomly selected on photographs (scale 1 : 12,000), were located as accurately as possible on the ground. All trees ⩾ 5 in. in d.b.h. were calipered and plot volumes for trees ⩾ 5 in. (*a*) and ⩾ 7 in. (*b*) in d.b.h. were computed from a local volume table. Data on other factors bearing on volume were collected. Photo measurements included, for each plot, the mean

height (X_1) and mean crown diameter (X_2) of respectively the 3 tallest and the 3 largest-crowned trees, and the crown cover % (X_3). This last was measured by the crown-density-scale method (description in the press) though the dot-grid method is considered somewhat superior. A very poor correspondence in tree numbers is attributed to multiple stems. Simple correlation coefficients of Y (plot volume) with X_1, X_2 and X_3 were 0·8412, 0·4218 and 0·2993 respectively for (*a*); and those for (*b*) were of similar order of magnitude. Multiple regression analysis, expressing Y as a linear function of the above variables plus 4 others, combinations of the same, and tests of error, led to the rejection of X_2 and the adoption of the equation

$$Y = b_3X_3 + b_4\frac{X_1X_3}{100}.$$

The values of the regression coefficients b_3 and b_4 (by least squares) were − 3·465 and 11·68 for (*a*). An aerial stand-volume table is given for (*a*) and (*b*) separately for 10-ft. intervals of stand height (40–110 ft.), and 20% intervals in crown cover [%], applicable to upland Oak in central Pennsylvania.

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

See also Nos. 282, 1097, 1111.

61. Forest Management: General, Theory and Principles

See also No. 281.

727. FEKETE, Z. A hazai erdörendezés története. **[History of Hungarian forest management.]** *Erdö* 3 (6), 1954 (190–8). 7 refs. [Hu.]

A brief account of the progress of administrative measures since the first royal decree on controlled felling in 1426 and the earliest surveys at the end of the 16th century up to the enactment of the first comprehensive law on forest exploitation in 1879 and the introduction of compulsory planned management in 1935.

728. BUCHHOLZ, E. Forsteinrichtung und Ertragskunde in der Sowjetunion. **[Forest management and principles of yield determination in the U.S.S.R.]** *Z. Weltforstwirt.* 17 (4), 1954 (130–3). 17 refs. [G.e.f.]

After an historical introduction the author gives figures, from Russian sources, for areas brought under management or surveyed in the years 1933–40, 1946–50, and 1954. He discusses the role of aerial survey and modern Russian evaluation principles, mainly on the basis of works by Anučin and Tretjakov.

729. BANKS, W. G. **Size of trees cut in the north-east for sawlogs and pulpwood.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 47, 1955. pp. 5.

Data based on more than 6000 trees cut for sawlogs and nearly 4000 cut for pulpwood are tabulated showing the % distribution, on both size and volume basis, by size class for sawlog and pulpwood trees, and different species groups.

730. ORAMAS, L., and LLANOS, D. Normas para la explotación regular y ordenada de los pinares de Canarias. **[Rules for the regular and ordered exploitation of Canary Island Pines.]** *Montes, Madrid* 11 (62), 1955 (125–6). [Span.]

Suggests that Canary Island Pines could be managed on a rotation of ⩽ 200 years (the ideal for timber production) if they were rationally exploited meanwhile for (1) Pine needles for banana packing and (2) resin tapping. Research on tapping methods is needed.

731. ALLEGRI, E. Détermination de l'époque d'abattage des peupliers en fonction de la forme du fût. **[Determination of exploitable age of Poplars as a function of stem form.]** [*Pap.*] *8th Sess. int. Poplar Comm., Madrid 1955*, No. *FAO/CIP/79-F*, 1955. pp. 3. [F.]

Discusses the factors involved, in general terms.

732. PETRESCU, L., and DISESCU, R. Producţia şi creşterile celui mai in virstă arboret de plopi negri hibrizi din ţară. **[The age of maximum yield and increment for hybrid Black Poplars in Rumania.]** *Rev. Pădurilor* 70 (3), 1955 (101–5). 5 refs. [Rum.]

Data are given and discussed for increment of a plantation of × *Populus marilandica*, measured at 14, 19, 24 and 32 years. C.a.i. culminated at 22, and m.a.i. at 25 years; the latter age is recommended for exploitation.

62. Working Plans. Annual or Periodic Yield. Yield Regulation

733. BIOLLEY, H. E. **The planning of managed forests by the experimental method and especially the check method (first published in 1920).** Transl. by M. L. Anderson. The Scrivener Press, Oxford. 1954. pp. 72 + 4 photos + 4 tbls. Price 7*s.* 6*d.*

734. ERASLAN, I. Hundertjährige Geschichte der Nutzungsregelung in den türkischen Wäldern. **[One hundred years of forest management in Turkey.]** *Z. Weltforstwirt.* 17 (4), 1954 (134–7). 22 refs. [G.e.f.]

Three periods are distinguished: The first, from the foundation of the first forestry school in 1857 to the Forest Law of 1917, introducing working plans in State forests; the second to the passing of the modern Forest Law of 1937; the third to the issuing of the latest revised instructions for working plans in 1952. The various silvicultural systems and methods of yield regulation in force at different times are critically discussed.

65. Special Business Problems of Timber-Growing. Calculation of Costs and Profitability. Valuation

See also Nos. 105, 284, 348, 413, 421, 520, 675.

735. MacGregor, J. J., *et al.* **Survey of private forestry costs: England and Wales: Third annual report for forest years 1952–53 and 1953–54.** Imperial Forestry Institute, Oxford. 1955. pp. 83. Price 7*s.* 6*d.*

Cf. *For. Abstr.* 16 (No. 802).

736. Gilmour, J. D. **Forest management: 'margin of production' formula.** *Emp. For. Rev.* 34 (1), 1955 (51–4).

The author outlines, with examples, his formula for determining the rental to be charged on forest lands—annual rental equals the excess productivity of a given piece of land over the productivity of the poorest land in use at the time.

737. Mascher, R. Der Reinertrag nachhaltiger Eichenbetriebsklassen. I. Der Eichenfurnierholzbetrieb. **[The net return from sustained-yield felling series of Oak. I. The management of Oak for veneer.]** *SchrReihe forstl. Fak. Univ. Göttingen* No. 9, 1953 (35–79). 65 refs. [G.g.]

An attempt to estimate the net annual return from veneer Oak on a 300-year rotation, with an understorey of Beech to ensure clear boles. The author bases his calculations chiefly on the records of the Salmunster district in the Spessart, which, though lacking certain age classes, comes nearest to his ideal case. On the basis of his own estimates—no suitable yield and assortment tables being available—and using prices ruling in December 1952, he arrives at a gross annual revenue of 759 DM/ha. for site class II/III (Schwappach) against an estimated total annual cost (including a renewal of the Beech understorey with nursery-grown saplings twice in each rotation) of 111 DM/ha. This net revenue/ha. is more than his estimate for Spruce on similar sites, and considerably more than that from agriculture. Interest is not taken into account.

738. Karlberg, S. Om klassificering av sumpmarker i Norrbotten med särskild hänsyn till beståndsutveckling och produktion efter dikning samt dikningens lönsamhet. **[The classification of swamp soils in Norbotten with particular reference to stand development and yield after draining, and the profitability of draining.]** *Norrlands SkogsvFörb. Tidskr.* 1955 (2), (207–39). 58 refs. [Sw.]

Divides the swamp sites into 3 main categories: open; Pine; Spruce and hardwood; with the subdivisions (*A*) lime-rich; (*B*) herb types; (*C*), (*a*) sedge types, (*b*) *Vaccinium myrtillus* types; (*D*) *Sphagnum* types (excluding *S. fuscum*); (*E*) *S. fuscum* types. The various categories are described and illustrated by photographs. Some 40 plots were laid out on old (1870 to 1948) drained swamps along the Norrbotten coast, and short-term results showing yield in cu.m./ha. for the different classes are shown in graphs, in comparison with figures before drainage and with results of a Finnish study. The increased capital values of the stands following drainage were calculated, and on the basis of the values obtained and the estimated costs of drainage, a table is given showing the suitability of the different types for drainage. On Spruce and hardwood swamps subdivisions *A–D*, on Pine swamps *A–C* and on open swamps *B*, are worth draining. [Cf. *For. Abstr.* 15 (No. 2779).]

68. Administration and Organization of Forest Enterprises

681. National (Federal, State) Forest Services and Administration

See also No. 1075.

739. Camaiti, A. L'Azienda di Stato per le Foreste Demaniali nella nuova politica forestale e montana. **[The National Office for State Forests and the new policy for forest and mountain.]** *Ital. for. mont.* 10 (3), 1955 (97–105). [It.f.]

Gives an account of the organization, financing and operation of this body, set up in 1953 to administer Italian State forests and supervise conservation measures in the mountains.

740. Bennecke, P. Die Entwicklung der Forst- und Holzwirtschaft in den letzten Jahren in Peru. **[The development of Peru's forestry and timber industry in recent years.]** *Z. Weltforstwirt.* 17 (5), 1954 (189–90). 2 refs. [G.]

The organization and activities of the Department for Colonization and Forestry, founded in 1940, are briefly described, including afforestation trials with Cedar [*Cedrela* spp.?] and Mahogany, the country's most important species, in the Department's experimental area at Manantay. The total cut for 1952 was 864,700 cu.m. against an estimated stock of 5600 million cu.m. and an import of 121,000 cu.m.

741. Muthanna, M. A., and Ramaswamy, M. N. **A short history of the Mysore Forest Department.** *Indian For.* 81 (7), 1955 (400–5).

The department was founded in 1864. By 1912 the area of state and reserved forest was 3532 sq. miles and the area under regular working plans 515 sq. miles.

685. Planning and Organization of Telecommunications

742. Weste, G. **Radio aids forestry in Victoria.** *Aust. Timb. J.* 21 (4), 1955 (280).

Details the equipment and organization of radio communications in the forest administration of ca. 15 million acres of forested country. Melbourne HQ speaks 3 times daily to 29 base stations, serving 200 portable, 2-way, 80-mile-radius, stations (forest operations, fire patrol etc.), which are divided into 3 frequency regions and have links with patrolling aircraft.

7. MARKETING. ECONOMICS OF TRANSPORT AND THE WOOD INDUSTRIES

743. **The state of food and agriculture 1955. Review of a decade and outlook.** FAO, Rome. No. C55/4, 1955. pp. 236.

Part I examines the recovery of agriculture, forestry and fisheries after the second World War, and Part II discusses post-war developments and future outlook for individual commodities (for forest products, these are roundwood, sawn wood, plywood and fibreboards, wood pulp, paper and board).

744. **Economic and timber trends in the Near East.** [*Docum.*] *1st Session FAO Near East For. Comm., Teheran 1955*, No. *FAO/NEFC/19*, 1955. pp. 55.

A note by the Secretariat, giving brief information on forest resources and industries for Afghanistan, Cyprus, Egypt, Ethiopia, Iran, Iraq, Jordan, Lebanon, Libya, Pakistan, Saudi Arabia, Syria, Turkey and Yemen.

71. Marketing of Forest Products: General

See also Nos. 753–4, 1111.

745. SEYMOUR, W. **Marketing of forest produce on private estates.** *Quart. J. For.* 49 (4), 1955 (271–6).

Discusses the difficulties and disadvantages of the haphazard methods of marketing general in Great Britain, and suggests possible regional organization.

72. The Quantitative Aspects of Marketing. Demand, Consumption and Supply

See also No. 740.

746. ZIVNUSKA, J. A. **Business cycles, building cycles and commercial forestry [in the United States].** Institute of Public Administration, New York. 1952. pp. 254. 117 refs.

747. ZIVNUSKA, J. A. **Supply, demand and the lumber market [in the U.S.A.].** *J. For.* 53 (8), 1955 (547–53). 2 refs.

Assumptions that emphasize demand aspects, e.g. the rising *per caput* consumption of metals and plastics at the expense of wood [cf. *For. Abstr.* 16 (Nos. 2093–4)] are criticized, and a working hypothesis of supply-and-demand trends is developed on the basis of data from 1921 to 1953. The concepts of price theory (illustrated in a diagram) and 'elasticity' in supply and demand are introduced to clarify the analysis, which reviews the trend of U.S. production and prices (in constant dollars) for 1921–53 and gives regression lines and equations for price and quantity for the periods 1921–29, 1931–41, 1947–53. Regional production is discussed and the conclusion reached that the lumber demand, while subject to great cyclical shifts, has a general upward trend, with its highest level in the recent post-war period. This expanding demand is probably becoming more elastic. The lumber supply, also fluctuating cyclically, shows an inelastic response to price in expansion at high levels and a more elastic response in contraction. The general trend is downward, the post-war period showing the highest level of costs. This declining supply is probably becoming more inelastic. An important reason for the decline is the shift from old to new-growth timber, but improvements in the application of labour, in logging and milling efficiency and in organization, rather than increases in standing timber, are the more immediately available controlling factors. Improved forest management, e.g. in the present very rapid development of private forestry, will limit supply, making it less elastic. For the individual producer, however, only a rising demand can hold prices above his rising costs. The rising demand of the recent tremendous economic expansion has increased the demand for alternative materials. A better product at a lower price may also be important in protecting and expanding the lumber market.

748. **Trends in economic sectors. The timber industry in Europe: trends on the timber market in 1954 and prospects for 1955.** Organisation for European Economic Co-operation, Paris. 1955. pp. 44 + 9 tbls.

749. ***Timber Bulletin for Europe.*** FAO, Geneva.

A continuation of the *Quarterly Bulletin of Timber Statistics for Europe.* Vol. 8 (1) [in English and French] includes, for the first time, tables of prices of timber and some of its competing materials. It gives market reviews for the first half of 1955 and production, trade, and price statistics for the 4 quarters of 1954 and the 1st quarter of 1955. Citation in *For. Abstr.*: *Timb. Bull. Europe, FAO.*

750. **T.D.A. year book of timber statistics 1954.** Timber Development Association, London. 1955. pp. 78.

Cf. *For. Abstr.* 16 (No. 811).

751. **The Soviet Union as producer and exporter of sawn softwood.** *Svensk Trävarutidn.* 1955 (9–12), (543 . . . 548; 607 . . . 615; 675 . . 683; 737 . . 746). [Sw.E.]

Reviews the supply of round timber, output of sawn timber, domestic consumption and exports, mechanization of felling and transport, and the geographic location of forest industries, and concludes that for some considerable time an increase of exports could take place only at the expense of domestic consumption.

752. MANN, F. M. **The Russian softwood trade.** *Timb. Tr. J.* Ann spec. issue, 1955 (79–80, 122).

Methods of bracking [shipment grading], shipping districts and the quality of their timber, organization and trading terms, with some export statistics (1912 into 1955).

753. BRAITHWAITE, J. D. **Marketing empire timbers.** *Wood* 20 (8), 1955 (317–20).

A general account of the history and organization of overseas timber buying in the U.K. and the effects on it of wars and recessions, with a comparison of U.S. conditions. The development of empire secondary timbers, desirable terms in timber concessions, and the organization of grading are outlined.

754. POLLARD, J. F. **A history of the efforts made to export timbers from Nigeria.** *Emp. For. Rev.* 34 (3), 1955 (285–93). 41 refs.

73. Prices

See Nos. 703, 747.

74. Trade Policy

755. **New South Wales timber monopoly inquiry. Extracts from addresses of counsel.** *Aust. Timb. J.* 21 (3–6), 1955 (200 . . . 231; 301 . . . 330, 351; 369 . . . 380, 412 . . . 449; 515 . . . 543).

The terms of reference were whether there is any monopoly or attempt to combine to control the supply and price of timber, or to restrain trade in timber, or for limiting the output or supply or price or competition in the timber trade.

756. **Regulations regarding the export of timber.** *Timb. Export Bull. Malaya* (*n.s.*) No. 1, 1955. pp. 5.

Gives current regulations on export of timber from Malaya, together with an appendix on minimum seasoning periods.

75. Trade Customs and Usages

See No. 752.

78. Economics of Transport

757. **[Timber handling and port working in the U.K.]** *Timb. Tr. J.* Ann. spec. issue, 1955 (207 . . . 217, 225 . . . 241, 245, 247, 265 . . . 299).

A general study of timber handling in ports, and special articles detailing the work at the Surrey Docks, Shoreham Harbour, Sharpness, Hull, Grimsby and Immingham, Tyneside etc., illustrated by maps and photographs.

758. JAY, G. **The deal porter. Aspects of his work in the London docks.** *Timb. Tr. J.* 214 (4121), 1955 (89, 98). 1 ref.

The organization of a 14-day course of instruction in piling, marking off and delivery, which have still to be done manually, is described with photographs.

79. Economics of the Wood Industries

See also No. 751.

759. HANDEL-MAZZETTI, P. Der Wiederaufbau der holzverarbeitenden Industrien Österreichs. **[The rehabilitation of Austria's wood-using industries.]** *Z. Weltforstwirt.* 17 (6), 1954 (225–32). [G.e.f.]

A report on post-war development in education, research and industry, containing a description of the organization and equipment of the newly founded Institute for Wood Research and the Austrian Wood Research Society [see *For. Abstr.* 13 (p. 119)] and a survey of modernization and enlargements (frequently carried out with E.R.P. funds) in sawmills, paper and board mills, veneer mills, and furniture industries. The wood-using industries received about 4 times as much money as forestry proper, and their demand has outstripped the capacity of Austrian forestry. The intensification of the latter, particularly on forest small-holdings, has therefore become of great economic importance.

760. WOOD, A. D. **Douglas Fir plywood industry.** *Timb. Tr. J.* 214 (4121), 1955 (86–7).

Describes the expansion of the industry in Oregon, California, Washington and British Columbia, with mill censuses of 1936 and 1955, the shift southward in the U.S.A., types of plywood made, the use of tropical species for facing, machinery giving improved utilization, the activities of important firms, and the development of integrated utilization.

761. **[The Murupara project.]** *N.Z. Timb. J.* 1 (11), 1955 (36 . . . 77, 109 . . . 111).

This issue contains a series of illustrated articles on the organization, finance and the work of the chief construction agents of the great saw- and pulp-milling project in the Bay of Plenty district. The first, under the above title deals with the 30-year struggle of the forest department to bring it to fruition. [Cf. *For. Abstr.* 16 (No. 4445).]

762. KELLY, E. B. **The determination of species run profit or loss at the green chain.** *B.C. Lumberm.* 39 (8), 1955 (48 . . . 54).

Gives six forms and outlines the costing procedure for a large sawmill. Advantages claimed are the derivation of the profit or loss per boom, diameter class or grade of log, species, grade or size of lumber, or per 1000 ft. day by day. Difficulties and costs of administering the plan are indicated.

763. **Comparative costs.** *Wood* 20 (9), 1955 (375–6).

Gives in tables average data collected in 1955 by the Furniture Development Council, London, on the breakdown of costs of furniture firms participating in the scheme.

8. FOREST PRODUCTS AND THEIR UTILIZATION

See also Nos. 7, 759, 1111.

764. CAMPREDON, J. Recherches et travaux du Centre Technique du Bois en matière d'utilisation du bois dans la charpente et la menuiserie. **[Research work of the Centre Technique du Bois on the utilization of wood in carpentry and joinery.]** *Ann. Inst. tech. Bâtim. Trav. publ., Paris* 8 (89), 1955 (413–26). [F.] P.R.

Describes in some detail the work done at the C.T.B. laboratories during the last year [1954–55?].

765. ENTRICAN, A. R., and REID, J. S. **Forest products research in N.Z.** *Timb. Tr. J.* Ann. spec. issue, 1955 (68–72).

A general review of the history, aims and methods of utilization research in New Zealand in the local setting of custom and trade.

766. **Hickory Task Force Report, Southeastern Forest Experiment Station.** Southeastern Forest Experiment Station, New Orleans, La.

The Hickory Task Force was set up to promote the utilization of Hickory (*Carya* spp.) by research and publication of known facts as a result of a conference in 1953 of federal, state, university and industrial representatives. The Southeastern Forest Experiment Station is to edit, publish and distribute reports under this programme. No. 1 appeared in June, 1955. Citation in *For. Abstr.*: *Hickory Task Force Rep. Stheast. For. Exp. Sta.*

767. **Report of committee D-7.** *Prepr.* [*Proc.*] *Amer. Soc. Test. Mater.* No. 40, 1955. pp. 30. P.R.

Includes: (1) Proposed revised tentative methods of static tests of wood poles (ASTM designation: D1036 - - - T); (2) Proposed revised tentative method of test for alpha-cellulose in wood (D1103 - - - T); and (3) Standard specifications for creosoted end-grain wood block flooring for interior use (D1031).

81. Wood and Bark: Structure and Properties

810. General Information on Woods

See also Nos. 160, 165, 167, 170, 180, 205, 208–9, 265, 277, 898, 1080.

768. **World timbers.** Timber Development Association, London. Vols. 1 and 2 [1952?]; Vol. 3 [1955?]. pp. 154 + 130 + 128. Price 5*s.* each volume.

The timbers, some 50 in each volume, are arranged alphabetically under the trade names and there are indexes of these and other common and scientific names. For each timber, the botanical and other names are given with brief notes on the tree and its distribution and details of the physical, mechanical, seasoning and working properties of the timber, its uses and supplies.

769. **Standard timber names of Indonesia, Malaya, N. Borneo and Sarawak.** *Malay. Forester* 8 (3), 1955 (138–44).

Tabulates, for 129 spp., botanical name, standard names in Malaya, N. Borneo, Sarawak, and Indonesia, synonyms, and remarks on general characteristics of the timbers.

770. LANG, W. G. **Forest utilization in Saint Lucia, British West Indies.** *Carib. For.* 15 (3/4), 1954 (120–3).

For the past 8 years a rational policy of exploitation has been carried out in the forest reserves of St. Lucia. A list of 21 native woods is presented with brief notes on their working properties and uses.

771. **Surinam timber—a summary with brief descriptions of the main timber species of Surinam.** Surinam Forest Service, Paramaribo. 2nd ed., 1955. pp. 91. 46 refs. [E.]

Includes some additional information on wood properties from research carried out at Yale University and at Wageningen University not available when the first edition [see *For. Abstr.* 13 (No. 4152)] was published.

772. **Specimen woods Nos. 234–7.** *Suppls.* to *Wood* 20 (6–9), 1955. Each pp. 2.

Paldao (*Dracontomelum dao*); Japanese Walnut (*Juglans* sp.); Kamassi (*Gonioma kamassi*); and Katsura (*Cercidiphyllum japonicum*).

773. D. Drei nordamerikanische Pine-hölzer. [**Three North American 'Pine' timbers.**] *Holz-Zbl.* 81 (114), 1955 (1355–6). 13 refs. [G.]

A description of *Pseudotsuga taxifolia*, *Pinus echinata* and *P. palustris*, including nomenclature, provenances, timber properties, uses and grading rules, preceded by a general explanation of North American log- and grading-rule principles.

774. **Properties of thinnings of home-grown Douglas Fir (*Pseudotsuga taxifolia*). Progress report 2—consignment No. 820.** Forest Products Research Laboratory, Princes Risborough. 1955. pp. 12 + 11 photos.

The material, 44-year trees from Somerset, compared favourably with the lower commercial grades of imported Douglas Fir. Live and dead knots were troublesome in machining and were the main factor causing degrade. Pruning young trees would give good results. Higher-grade timber could be used for house carcassing and construction work; lower grades would be useful for portable building and outhouses, but as they tend to split when nailed, they would be unsuitable for boxes and crates.

775. **Properties of thinnings of home-grown Western Hemlock (*Tsuga heterophylla*). Progress report 1—consignment No. 809.** Forest Products Research Laboratory, Princes Risborough. 1955. pp. 11 + 10 photos.

Timber from 54-year trees from Dunster, Somerset, had a good moderate rate of growth, and sp. gr. of 0·405 compared with 0·41 for imported timber. Half the volume fell into grades I and II and only 13% in grade IV. Early pruning might be advisable in view of the large number of small, loose knots. The timber worked well and the knots caused no difficulties. It could be used, grade for grade, like imported timber.

776. STEPHENS, M. **The timber of *Melanorrhoea torquata* (Rengas).** *Malay. Forester* 8 (3), 1955 (160–1).

General properties, defects, working qualities, seasoning, natural durability and amenability to preservative treatment, mechanical properties, and uses.

777. STEPHENS, M. **The timber of *Cyathocalyx maingayi* (Mempisang).** *Malay. Forester* 8 (3), 1955 (161–3).

General properties, defects, working qualities seasoning, natural durability and amenability to preservative treatment, mechanical properties, and uses.

778. PEDRO, E. R., SEABRA, L. DE, FERREIRINHA, M. P., and SOUSA, A. E. DE. ***Pterocarpus angolensis* DC.** *Repr.* from *Garcia de Orta, Lisboa* 3 (1), 1955 (11–31 + 8 plates). 34 refs. [Port.e.]

Deals with taxonomy and morphology, gives some diameter measurements taken in Mozambique, and presents data on wood anatomy, physical properties of the wood, its pulping properties and uses, and on the production of timber in Mozambique.

779. NARAYANAMURTI, D. **Composite wood timbers: *Cedrela toona* —Toon.** *Comp. Wood* 2 (2), 1955 (39–46). 19 refs. P.R.

780. **The properties of Australian timbers: Spotted Gum.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 208, 1955 (3).

Gives for *Eucalyptus maculata* the habit, distribution, timber properties, seasoning and uses.

781. Douka. [***Mimusops* (*Dumoria*) *africana*.**] *Bois For. Trop.* No. 42, 1955 (37–40). [F.]

Range, silvicultural characters, properties and uses of wood.

782. DUBOIS, F. Essais industriels sur le bois du peuplier de Selys. **[Industrial tests on the wood of × *Populus serotina* cv. 'de Selys'.]** *Spec. Pap. 8th Sess. int. Poplar Comm., Madrid 1955*, No. *FAO/CIP/75-D Add.* 1, 1955 (85–91). [F.]

Gives test data on 5 logs of this fastigiate variety of × *P. serotina*, which it is thought might be a good substitute for *P. nigra* var. *italica* for ornamental planting. The wood is of a good appearance and texture for cabinet-making, and free from tension wood, its principal defect being a tendency to knottiness, included bark, and *Cossus* attack. It is suggested that pruning might produce usable, knot-free logs of 4–5 m.

783. **Mumuli, *Holoptelea grandis*.** *Timb. Leafl. For. Dep. Uganda* No. 24, 1955. pp. 2.

Habit, distribution, frequency, macroscopic characters, mechanical properties, seasoning, durability, preservation, working qualities, suitable saws and uses.

811. Structure, Identification

784. JOHNSTON, D. R. **Structure drawings to 'Specimen woods' Sheets 48–51.** *Wood* 20 (6–9), 1955 (230; 280; 321; 358).

(48) Manio (*Podocarpus* spp.), Salmwood (*Cordia alliodora*), Spotted Gum (*Eucalyptus maculata*), and African Mahogany (dry zone) (*Khaya senegalensis*).

(49) Blackbutt (*Eucalyptus pilularis*), Ironbark (*E. crebra*), Kurokai (*Protium decandrum*), and Mengkulang (*Tarrietia* spp.).

(50) Wamara (*Swartzia leiocalycina*), Alstonia (*A. congensis*), Siamese Kwao (*Adina cordifolia*), and Red Satinay (*Syncarpia hillii*).

(51) Brush Box (*Tristania conferta*), Canarium (*C. schweinfurthii*), Turpentine (*Syncarpia laurifolia*) and Tawa (*Beilschmiedia tawa*).

785. BASCOPÉ VARGAS, F. Estudios estructurales de ciertas maderas de los bosques del Valle de la Mucuy, cerca de Mérida. Clave de las maderas estudiadas. **[The structure of some timbers from the Mucuy Valley, near Mérida. Key to the timbers studied.]** *Bol. Ingen. for. Univ. Los Andes* 2 (7), 1955 (29–32). [Span.]

Cf. *For. Abstr.* 16 (No. 2136).

786. KAEISER, M. **A report on the mature wood of the Syrian or drupe-fruited Juniper, *Juniperus drupacea* Labill.** *Amer. Midl. Nat.* 51 (1), 1954 (306–10). 9 refs. B.A.P.

A microstructural study which confirms the belief that the species is more closely allied to *Juniperus* than to any other genus of the Cupressaceae.

787. LEMESLE, R., and DUCHAIGNE, A. Particularités histologiques des constituants du bois chez les Dégénériacées; leur rôle dans la phylogénie de cette famille. **[Histological peculiarities of wood elements of the Degeneriaceae: their role in the phylogeny of the family.]** *C.R. Acad. Sci., Paris* 240 (10), 1955 (1122–3). 2 refs. [F.f.] O.R.S.

In *Degeneria vitiensis*, the elements of the lignified tissue often form vertical rows, tapering at the ends; these consist of 4–8 cells whose walls contain bordered pits, often scalariform. They may suitably be called 'pseudo-tracheids'. This feature, and the character of the vessels, indicate that the wood is of a very primitive type. [Cf. *For. Abstr.* 4 (p. 97).] *From authors' summary.*

788. REINDERS-GOUWENTAK, C. A., and RIJSDIJK, J. F. **Wood anatomical characterization of the leguminous taxa.** *Proc. ned. Akad. Wet.* 58*C* (1), 1955 (41–50). 23 refs. [E.e.] O.R.S.

The characters used are the storeyed-structure features, the shape of the marginal ray cells and the ray structure. A key to the taxa is given. *From authors' summary.*

789. BRANDÃO, N. Contribuição ao estudo anatômico do sabiá. **[A study of the wood anatomy of *Mimosa caesalpiniaefolia*.]** *Agronomia, Rio de Janeiro* 13 (1), 1954 (85–90). 6 refs. [Port.] L.S.

790. CANRIGHT, J. E. **The comparative morphology and relationships of the Magnoliaceae—IV. Wood and nodal anatomy.** *J. Arnold Arbor.* 36 (2/3), 1955 (119–40 + 25 photos.) 58 refs.

A critical examination of the relationships of *Alcimandra, Aromadendron, Elmerillia, Kmeria, Liriodendron, Magnolia, Manglietia, Michelia* and *Talauma*, based on the wood anatomy of 61 species (7 genera) and of herbarium twigs (2 genera) with notes on phloem and exomorphology and details of the vascular-trace organization.

811.1. Anatomical Elements and Tissues

See also Nos. 797, 801, 811, 817, 1011.

791. **The mechanism of surface growth in plant cells.** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1953/54*, 1954 (89).

Evidence has been obtained that surface growth in fibres and tracheids, during differentiation, proceeds by localized tip growth of the cell and, in the body of the cell, by the so-called 'mosaic' growth, in which it is visualized that, at a number of points in the primary wall, the microfibrillar network of cellulose is pushed aside by localized cytoplasmic synthesis. This process, acting under cell turgor, enlarges the surface, and the enlarged surface is subsequently interwoven with new microfibrils of

cellulose. It has been suggested that the thin areas participating in mosaic growth are in fact areas in which the cell walls are penetrated by plasmodesmata. In terms of this concept, the co-ordinated growth existing between the cells can be understood, and much of the minute anatomy of cell walls may be regarded as manifestations of localized growth occurring in the regions of what are initially plasmodesmata.

792. **The intermicellar system of cellulose fibres.** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1953/54*, 1954 (89).

The magnitude of capillary spaces has been investigated in fibres from Spruce, various Eucalypts, and flax, using the method of gold deposition. Examination of gold-impregnated material by means of the electron microscope has resulted in a visual demonstration of the intermicellar system.

793. BUVAT, R. Observations sur la structure des ponctuations aréolées dans le xylème secondaire de *Pinus sylvestris* L. **[Observations on the structure of bordered pits in the secondary xylem of *P. sylvestris*.]** *C.R. Acad. Sci., Paris* 239 (23), 1954 (1667–9). 2 refs. [F.] O.R.S.

The pit membranes are not only perforated but are so fine that they scarcely sustain the torus. The tracheids can no more be considered as closed cells than the vessels of Angiosperms. *From author's summary.*

794. NYSTERAKIS, F., and QUINTIN, S. Quelques considérations évolutives à la suite des modifications par l'auxine des trachéides d'*Araucaria excelsa*. **[Evolutionary considerations in the light of modifications to tracheids of *A. excelsa* caused by a growth regulator.]** *C.R. Acad. Sci., Paris* 240 (6), 1955 (658–61). 7 refs. [F.f.] O.R.S.

Twigs of 4-year plants were treated with indolyl-acetic acid. The tracheids formed after treatment became scalariform and ranged in length from 3 to 6 mm., compared with 10–15 mm. in untreated material. The significance of this development in relation to the cyclic theory of evolution is discussed.

795. GOVINDARAJALU, E., and SWAMY, B. G. L. **Size variation of septate wood fibres in *Pithecolobium dulce* Benth.** *Nature, Lond.* 176 (4476), 1955 (315). 1 ref. [Dept. of Botany, Presidency College, Madras.]

In *P. dulce* septate and non-septate fibres are intermixed throughout the secondary xylem. A disc of 9-in. radius from 2 ft. above ground level was investigated, measurements of tracheal elements being made at every successive inch from the centre outwards. The results (graphed) showed a gradual increase in length of vessel members in the early stages (to the 2nd inch from the centre) after which length was more or less constant. Both non-septate and septate fibres behaved similarly to vessels in the early stages, but later their length was subject to considerable variations. The length/age curves for the two types of fibre are more or less parallel, the septate fibres not only being longer than the non-septate from the initial stages, but maintaining the same relatively greater length throughout the ontogeny.

796. SCARAMUZZI, G. **Dimensional data about fibers in *Populus* × *euramericana* (Dode) Guinier cv. 'I-214'.** [*Pap.*] *8th Sess. int. Poplar Comm., Madrid 1955*, No. *FAO/CIP/79–C*, 1955. pp. 20 + 14 dgms. and gphs. [E.] [Centro di Sperimentazione Agricola e Forestale, Ente Nazionale per la Cellulosa e per la Carta, Rome.]

An analytical study was made of one tree, and a partial study of two others, all from a 10-year-old plantation at Casale Monferrato. Fibre length was found to decrease with stem height in all rings inspected. Fibre length/diameter ratio kept constant through the lower half of the tree, with a noticeable fall in values at the top. Fibre length increased from the pith towards the bark as far as ring 6–8 (varying with individual and height in stem) beyond which values tended to be constant. Wall thickness tended to increase from pith towards the bark. Length/diameter values increased from pith to ring 7–8, beyond which a constancy of slight decreased in values occurred. For each feature, an increase in value from early to late wood was found.

811.2. Special Features and Abnormal Structure

797. **Tension wood.** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1953/54*, 1954 (88).

Three different types of tension-wood fibres have been observed. In each, a typical gelatinous layer is present, but the number of other layers of the secondary wall varies, as does their degree of lignification. It has been concluded, from experiments to date, that the formation of tension wood is the response of the stem or part thereof to stimuli necessary to achieve or maintain inherent characteristics of form. It has also been demonstrated that changes similar to those in the wood take place in the bark. The bark fibres formed on the tension-wood side have a structure comparable with that of tension-wood fibres and different from that of bark fibres on the opposite side of the stem.

798. JACQUIOT, C., and HERVET, N. Contribution à l'étude des 'poches à kino' des *Eucalyptus*. **[Gum veins in Eucalypts.]** *Rev. Path. vég.* 33 (4), 1954, (199–207). 5 refs. [F.e.] I.M.I.

These kino pockets, ascribed to traumatic response (knots, cambium miners, wood borers, fire) contain technologically valuable secretions [cf. *For. Abstr.* 13 (No. 3501)]. Their anatomical development is here studied in *E. maculata*.

799. MERGEN, F., and ECHOLS, R. M. **Number and size of radial resin ducts in Slash Pine.** *Science* 121 (3139), 1955 (306–7). 2 refs. O.R.S.

Material studied was from wood samples taken at breast height from 10 trees. Inspection of data showed that (1) the number of radial ducts per unit area is highest in the rings nearest the pith, decreasing rapidly until the 20th year and then levelling off; (2) a similar relationship exists with average ring width, the number of ducts decreasing with decreasing width; and (3) average size of resin duct decreases linearly with age of ring. It was not

possible to determine whether age or ring width was the more important; in the 10 trees studied, average ring width decreased with age of tree, and a study on a larger number of older trees would be necessary to determine the relative importance of the two factors. The relationship of number and size of duct to age and ring width is similar in pattern to that of wood density and strength characteristics. The volume of resin ducts probably accounts in part for this pattern by directly influencing density and strength of the wood, particularly in the first 5 rings where ducts are most abundant. [Cf. *For. Abstr.* 16 (No. 3806).]

811.4. Growth Rings. Early and Late Wood

See also No. 812.

800. DAUBENMIRE, R. **Xylem layers of trees as related to weather and altitude in the northern Rocky Mountains.** *Ecology* 36 (3), 1955 (456–63). 17 refs.

In each of four taxa of trees (*Pinus ponderosa*, *Pseudotsuga taxifolia* var. *glauca*, *Abies grandis*, and *Thuja plicata*), wood layers were studied in individuals situated at the lowest and highest ecological limits along the western edge of the northern Rocky Mountains near Moscow, Idaho. So much discordance was found in the sequences of thick and thin layers along opposed radii of the same individual, that no relationship between xylem formation and climate could be detected over a 50-year period. These results are remarkable for the fact that, although low-altitude individuals consistently grow more rapidly in early spring, and show more drought shrinkage during the dry season in comparison with high-altitude individuals, variations in the supply of heat and moisture during these seasons do not seem to affect the total amount of wood produced. The altitudinal relationship is thus different from the homologous latitudinal relationship in which temperature is said to become relatively more critical for tree growth in a poleward direction, and moisture more generally limiting in an equatorial direction. The environmental factors which set upper and lower limits, therefore, do not measurably affect the total growth of mature individuals, but probably operate through control over germination or survival. The two xerophytic species, *Pinus ponderosa* and *Pseudotsuga taxifolia*, seem incapable of rapid diameter growth along their upper limits, whereas the two mesophytic species *A. grandis* and *T. plicata*, can grow equally at either ecological limit. Along its upper altitudinal limits, the development of heartwood in *Pinus* is feeble and greatly postponed, but *Pseudotsuga* and *Thuja* show no difference in this respect. *From author's summary.*

811.5. Sapwood and Heartwood

See also No. 988.

801. HARRIS, J. M. **Heartwood formation in *Pinus radiata* (D. Don.).** *Tech. Pap. N.Z. For. Serv.* No. 5, 1955. pp. 8. 10 refs. (*Repr.* from *New Phytol.* 53 (3), 1954 (517–24).)

Results of observations on some 12,000 bordered pits are shown in graphs. The general trend is for the % of aspirated pits to increase gradually from the last-formed annual growth ring to the edge of the 'dry-wood' zone (i.e. the zone surrounding the darker coloured heartwood and containing much less water than the sapwood). Here ca. 50% of pits are aspirated. Within the dry-wood zone, the figure is above 90% and there is a further slight increase through the heartwood. Similar patterns are observed for dominant and suppressed trees after the outermost 2 or 3 growth layers where a lower % of pits is aspirated in dominant trees. It can be stated with some certainty that in a region where more than 50% of pits are aspirated, the passage of water through the system is nearly impossible; wood tracheids of the dry-wood zone are therefore no longer directly connected with those of the sapwood, and any passage from one tissue to another can only take place through the living cells of the rays. A physiological system is suggested which would explain how *P. radiata* subject to recurrent physiological drought retains, as a result of tension in the water columns, a maximum volume of sapwood for water conduction and storage. [Cf. *For. Abstr.* 15 (No. 629); 16 (No. 877).]

811.6. Texture, Grain, Figure

See Nos. 139, 147.

812. Physical and Mechanical Properties

See also No. 712.

802. SEKHAR, A. C., and BHATNAGAR, S. S. **Physical and mechanical properties of woods tested at Forest Research Institute [, Dehra Dun].** *Indian For.* 81 (7), 1955 (420–3 + tbl.).

Gives test data for *Ougeinia dalbergioides*, *Chloroxylon swietenia*, *Cryptomeria japonica*, *Altingia excelsa*, *Canarium strictum*, *Myristica attenuata*, *Lophopetalum wightianum*, *Anisoptera glabra*, *Cinnamomum inunctum*, and *Mallotus philippinensis*.

803. TAKAHASHI, Y., and KUROKI, S. **[Studies on the mechanical properties of woods from south Kyushu. On the strength of the Kirishima Akamatsu (*Pinus densiflora* from Mt. Kirishima).]** *Bulletin of the Faculty of Agriculture, Kagoshima University* No. 3, 1954 (48–60). [Jap.e.]

Minimum, maximum, and average values for physical and mechanical properties are shown in an English table and in graphs with English legends.

804. REIS, F. DA SILVA. Um estudo físico-mecânico de madeira de pinheiro bravo (*Pinus pinaster* Soland in Ait.). **[The physical and mechanical properties of *P. pinaster*.]** *Estud. Inform. Serv. flor. aqüic. Portugal* No. 47-*D*3, 1955. pp. 55 + 8 plates. [Port.] Limited distribution.

The results of a study on wood from 3 *Pinus pinaster* trees (125 years old) from the National Forest of Leiria, Marinha Grande. The trees had all been tapped at intervals since 1890, and were finally tapped to death. The data are given in a number of tables. It was found in all three trees, that sp. gr. and most of the mechanical strength properties diminished from the butt upwards. No comparison was made with wood from untapped trees.

812.1. Optical, Acoustic, Frictional, Thermal and Electrical Properties

See also No. 808.

805. **Specific heat and heat of wetting of wood.** *Rep. For. Prod. Res. Bd., Lond. 1954*, 1955 (45–6).

The difference between observed and calculated specific heats of wood [see *For. Abstr.* 16 (No. 886)] can be shown to equal the variation of rate of change in heat of wetting with temperature. A curve connecting heat of wetting with moisture content of Beech sawdust is in reasonable agreement with previous determinations and shows that the initial heat of wetting at 39° C. is about 17 calories/g. falling to zero at about 32% m.c. Measurements have also been made of the variation of the heat of wetting of dry Beech sawdust with temperature. The results are rather scattered, but show that change with temperature is in the right direction and of the correct order of magnitude to account for the discrepancy between observed and calculated specific heats.

806. CHUDINOV [ČUDINOV], B. S. **The specific heat of frozen wood.** *Transl. Div. For. Prod. Aust.* 1955. pp. 5. 2 refs. Transl. by Casan from *Derev. lesohim. Prom.* 3 (6), 1954 (18–20). Limited distribution. P.R.

Derives from existing data and empirical equations an equation and nomogram for calculating the specific heat of frozen wood (irrespective of species).

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 805, 816, 928, 933, 939, 971, 975–6, 1004, 1014.

807. RUNKEL, R. O. H. **The sorption of wood fibres from the morphological and chemical points of view.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 2530, 1955. pp. 20 + 5 dgms. 34 refs. Transl. by M. Slade from *Holz Roh- u. Werkstoff* 12 (6), 1954 (226–32). [See *For. Abstr.* 16 (No. 895).] Limited distribution. P.R.

808. SHIBAMOTO, T., and INOUE, Y. **[Studies on some properties of stem and shoot of Bamboo (*Phyllostachys edulis* Riv.)—especially on properties relating to water.]** *Bull. Tokyo Univ. For.* No. 47, 1954 (189–200). 9 refs. [Jap.jap.e.]

Hygroscopicity in cut Bamboo stems increases radially inwards; it is greatest from the 7th to the 12th internode, in the young shoot on the 7th day after sprouting from the ground, and in the stem cut in June. All values are reduced by extraction in hot water. The growth of moulds generally varies directly as the hygroscopicity. At 7% moisture content (m.c.), evaporation and hygroscopicity rates show a sudden, large change which coincides with the change in the dielectric-constant curve, presumably because at this m.c. free water has been removed and only combined water is left. In the young shoot, the critical point does not appear, possibly because of chemical complications. The hygroscopicity of the following substances and the evaporation rate (of their solutions) decreased in the order: peptone > sucrose > glucose > cellulose. The affinity between preservatives and Bamboo appears to be: DNC > Na-PCP > $CuSO_4$. The hygroscopicity of treated Bamboo decreases in order of preservatives used, as follows: $CuSO_4$ > DNC > Na-PCP.

809. ROOSEN, P. La teneur en eau des tiges de peupliers euramericains en Belgique. **[The water content of standing stems of hybrid Black Poplars in Belgium.]** *Spec. Pap. 8th Sess. Int. Poplar Comm., Madrid 1955*, No. *FAO/CIP/75-D Add.* 1, 1955 (53–66). 8 refs. [F.] [Laboratoire forestier de l'État, Gembloux.]

A study was made of material from 41 trees, including × *Populus robusta*, × *P. regenerata*, × *P. serotina* and × *P. marilandica*, 15–22 years old. Preliminary results indicate that the moisture content (m.c.) of the wood of standing Poplars is high in comparison with that of other species—96–254%, average 180%. It fluctuates transversely and longitudinally with position in the tree, but there is no variation with orientation. The m.c. of the periphery is considerably less than that of the centre (average 65%). M.c. decreases from ground level upwards, and this decline is greater in the centre than at the periphery. M.c. of × *P. regenerata* is higher than that of the other hybrids which are in the following diminishing order of mean m.c.—× *P. serotina*, × *P. robusta*, and × *P. marilandica*. There is no significant difference in distribution of m.c. between hybrids. M.c. is higher in trees growing in a damp soil, and higher in spring than in autumn or summer. There was no indication that m.c. had any relation to incidence of frost-crack.

810. CURRO, P. **Variations in moisture content, basic density, and oven-dry density in *Populus* × *euramericana* (Dode) Guinier cv. 'I-214'.** [*Pap.*] *8th Sess. int. Poplar Comm., Madrid 1955*, No. *FAO/CIP/79-D*, 1955. pp. 5. [E.] [Centro di Sperimentazione Agricola e Forestale, Ente Nazionale per la Cellulosa e per la Carta, Rome.]

A study was made of 4 trees in an even-aged plantation of 10 years (+ 2 in the nursery), felled respectively in (*a*) March, (*b*) June, (*c*) September and (*d*) December. In each of the trees, moisture content (m.c.) was the highest at ground level; ground-level m.c. was highest in (*a*) and (*d*). The highest value (300%) was found near the longitudinal axis. M.c. decreased progressively from pith towards the bark, except for a slight increase in the outermost or two outermost rings. In (*a*) and (*d*), m.c. decreased from butt to top of the stem; in (*b*) and (*c*) the minimum value was in an intermediate position between butt and top. Oven-dry density in all trees increased from the pith towards the bark; it also increased with the height of the tree, and more considerably in the upper half. The bearing of these findings on the sale of wood by weight is discussed.

811. **Structure in relation to properties.** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1953/54*, 1954 (89).

High longitudinal shrinkage values have been obtained for the wood from successive growth rings from the pith in *Pinus taeda* and *P. ponderosa*, and this seems to be associated with large fibrillar angles, which, instead of decreasing with age as

expected, have remained high over some 15 growth rings from the pith.

812. ERICKSON, H. D. **Tangential shrinkage of serial sections within annual rings of Douglas Fir and Western Red Cedar.** *For. Prod. J.* 5 (4), 1955 (241–50). 35 refs.

Shrinkage was measured by image projection, using thin serial sections (0·15–0·5 mm.) across the ring. The data show that, as a rule, shrinkage is least in the cell layers in the first part of the early wood (e.w.) and increases towards the visible transition to late wood (l.w.). Shrinkage within the l.w. is likewise not uniform. The % shrinkages for various specimens of Douglas are graphed, and the mean and maximum shrinkage for e.w. and l.w. are given for both species.

813. **Shrinkage tests.** *Rep. For. Prod. Res. Bd., Lond. 1954*, 1955 (10).

Shrinkage tests on Elm gave similar results to those previously carried out on Beech [see *For. Abstr.* 15 (No. 656)], indicating that samples slowly dried at high temperatures tended to shrink appreciably more than matched samples slowly dried at low temperatures. Shrinkage started at high moisture contents, well above the generally accepted value of the fibre saturation point. Tangentially cut specimens expanded initially at high temperatures. Slow drying produced considerably more shrinkage than fast drying, and the shrinkage of specimens dried very rapidly appeared to be independent of temperature.

814. NEARN, W. T. **Effect of water soluble extractives on the volumetric shrinkage and equilibrium moisture content of eleven tropical and domestic woods.** *Bull. Pa. agric. Exp. Sta.* No. 598, 1955. pp. 38. 24 refs. (*Forestry School Series* No. 2.)

The object of this study was to determine the effect of extractions on the volumetric shrinkage of certain species that show an abnormally low volumetric shrinkage for their sp. gr. class. The species investigated were *Picea sitchensis*, *Sequoia sempervirens*, *Robinia pseudoacacia*, *Chlorophora tinctoria*, *Carapa guianensis*, *Hymenolobium excelsum*, *Swietenia macrophylla*, *Tectona grandis*, *Taxus brevifolia*, *Pinus* sp. ('Southern Pine'), and *Pinus* sp. impregnated with phenolic resin. Test methods and data are given in detail and the results discussed. It is concluded that the low volumetric shrinkage of these species is a result of their low fibre-saturation point (f.s.p.). The low f.s.p. values of *S. sempervirens*, *R. pseudoacacia*, *C. guianensis*, *H. excelsum* and *T. brevifolia* are due to the bulking action of essentially water-soluble materials, which occupy a portion of the space in the fine structure of the cell wall that normally would be occupied by water. These materials may be removed most effectively by leaching in hot water. A similar bulking action accounts in part for the low f.s.p. values of *T. grandis*, *C. tinctoria*, and *S. macrophylla*, but in these woods a difference in the chemical composition of the cell wall may possibly be a contributory factor. It was found that removal of the extractives caused an increase in equilibrium m.c. at high relative humidities (r.h.), but that at low r.h., extracted and unextracted material reached the same equilibrium m.c. (*T. grandis* and resin-impregnated Southern Pine were possible exceptions.)

815. KUMAR, V. B. **Effects of organic liquids on the strength and swelling anisotropies of wood across the grain.** *Norsk. Skogind.* 9 (7), 1955 (243–8). 8 refs. [E.e.nor.] P.R.

Investigations were made to determine the effect of impregnation with 5 alcohols, 4 organic aliphatic acids, pyridine, or distilled water, on the swelling and compressive strength anisotropies of sapwood blocks of Beech, Birch, Poplar (*Populus nigra*) and Scots Pine. Typical load deformation curves for the various species and impregnations and tables showing the deformation and swelling ratios are given. The anisotropic ratios were found to vary with species and liquids. No quantitative relation was found between the two anisotropies.

812.3. Density. Specific Gravity. Buoyancy

See also Nos. 810, 855.

816. KELSEY, K. E. **The apparent density of wood substance.** *Repr.* from *Aust. J. Appl. Sci.* 6 (2), 1955 (190–6). 12 refs.

The apparent density of the wood substance of dry *Pinus radiata* wood flour has been determined in water and in 9 organic displacement liquids. The effect of molecular weight on this density appears to be significant only within a homologous series and for non-swelling liquids. A positive correlation has been found between the apparent density and the external swelling produced by the displacement liquid. The results indicate that differences in the degree of penetration by the displacement liquid are not the sole cause of the observed variations in apparent density, but that the forces of interaction between the wood and the liquid play an important part. *From author's summary.*

817. VORREITER, L. Rechnungsmässige Bestimmung der Zellwanddichte aus den Holzkonstituenten. **[Calculating the cell-wall density from the wood constituents.]** *Holz Roh- u. Werkstoff* 13 (5), 1955 (185–8). 17 refs. [G.g.] P.R.

Suggests a method of calculating cell-wall density from the % composition of wood and the densities of its main constituents (cellulose, 1·58; lignin, 1·40; and hemicelluloses, 1·50 g./c.c.).

812.7. Strength Properties

See also Nos. 767, 815, 855, 888, 908–9, 951, 976–7.

818. KOLLMANN, F., and HILTSCHER, R. Über spannungsoptische Untersuchungen an geschichteten Biegestabmodellen. **[Stress-optical investigations on laminated bending-test beam models.]** *Holz Roh- u. Werkstoff* 13 (6), 1955 (209–11). 5 refs. [G.g.] P.R.

Laminated bodies made from cast resins of different curing characteristics have been found to constitute suitable models for the stress-optical investigation of the stress distribution in wood members. For thick, relatively short, laminated beams, the longitudinal stresses give a serrated

graph similar to that derived theoretically by Ylinen [cf. *For. Abstr.* 9 (No. 1614)]; in these, the total strength is determined by the shear strength of the early wood. In long beams without appreciable shear, the late-wood zones protect the weaker early-wood zones against excessive stress.

819. KUMICHEL, W., and HOLZ, D. Das Höppler-Konsistometer—ein Gerät zur Bestimmung der Kegeldruckhärte von Hölzern. **[The Höppler 'consistometer'—a cone-headed device for determining the hardness of wood.]** *Holz Roh- u. Werkstoff* 13 (5), 1955 (188–93). 13 refs. [G.g.] P.R.

Illustrated description of a modification of the Höppler 'consistometer', suitable for determining the 'hardness' of wood, expressed as the 'cone flow characteristic' in kg./sq. cm., the force being the load applied, and the area, the projection of the indentation surface, viz. the area of a circle whose radius is equal to the depth of indentation. Experimental conditions (optimum load, loading, and no-load periods) have been determined for Beech and Pine wood. The end-grain/side-grain hardness ratio has been found to be 1·2 for oven-dry wood and to decrease with increasing moisture content, until it reaches a value < 1 at the fibre-saturation point.

820. SUDDARTH, S. K. **A statistical method for analysis of factor relationships between two sets of data.** *Sta. Bull. Ind. agric. Exp. Sta.* No. 615, 1954. pp. 15. 5 refs.

A method is presented whereby a factor, θ, is calculated which, for a given fiducial range, can be applied as a lower limit to the factor relationship between populations. In the example shown the *A* sample is represented by a new and exploratory shear test which, when compared with the *B* sample, must demonstrate its advantages in quantitative terms if further use is to be made of the new test system. The method can, however, be used in any field where questions of minimal factor relationship arise.

821. RADCLIFFE, B. M., and SUDDARTH, S. K. **The notched beam shear test for wood.** *For. Prod. J.* 5 (2), 1955 (131–5). 15 refs.

A comparison between data, statistically analysed for the 99·75% fiducial range, for shear strength as determined by the standard ASTM shear test and from use of a laterally notched beam specimen (illustrated) showed that wood possesses a substantially higher shear strength than that indicated by the ASTM test. The actual distribution of shear stress on the critical planes of the ASTM and of the notched specimen was determined, using strain gauges. The distribution of shear stress was not uniform in the ASTM specimen, and, although results were improved by a modification relieving the sharp re-entrant corner, this modified specimen is not recommended since shear failures are often preceded by failures in tension parallel to the grain. The adoption of the notched beam test as standard is recommended.

822. **[Strength of *Eucalyptus pilularis* thinnings.]** *Rep. For. Comm. N.S.W. 1953/1954*, 1955 (13).

E. pilularis thinnings were sawn and tested for mechanical properties. Results showed that the strength of this species is adequate for general building purposes, being similar to *E. gigantea* and superior to Douglas Fir. Strength increased steadily from the pith to the bark, and at 3 in. from the pith was ca. 75% of that of wood sawn from logs of normal size.

812.8. Workability. Working Properties

See No. 989.

813. Wood Chemistry

See also Nos. 33, 807, 927, 963, 969, 995 *et seq.*

823. YANOVSKIĬ [JANOVSKIĬ], V. V., MALEVSKAYA [MALEVSKAJA], S. S., EVTROP'EVA [EVTROPJEVA], E. I., and AVRUNINA, V. M. **Preparation of wood cellulose with the aid of organic solvents.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 2643, 1955. pp. 10. Transl. by R. Casan from *Ž. prikl. Him.* 27 (3), 1954 (334–40). [See *For. Abstr.* 16 (No. 918).] Limited distribution. P.R.

813.1. Chief Organic Constituents. Constituents of the Cell Wall

See also Nos. 767, 817.

824. HARRIS, E. E. **Progress in the chemistry of lignin 1943–1954.** *Rep. U.S. For. Prod. Lab., Madison* No. 2020, 1955. pp. 57. 535 refs. P.R.

Cf. *For. Abstr.* 16 (No. 4526).

825. FREUDENBERG, K., REZNIK, H., FUCHS, W., and REICHERT, M. Untersuchung über die Entstehung des Lignins und des Holzes. **[Research on the origin of lignin and of wood.]** *Naturwissenschaften* 42 (2), 1955 (29–35). 7 refs. [G.g.] [Universität Heidelberg.] O.R.S.

Discusses previous research on the part played by a β-glucosidase, present in lignifying cells, in splitting *d*-coniferin into glucose and coniferyl alcohol, the latter being converted to lignin by a redoxase present in the neighbourhood of the cambium [cf. *For. Abstr.* 15 (No. 2850)]. In the present experiments, radioactive *d*-coniferin or *d*-glucovanillin was introduced into young Spruce plants, by injection or through the needles. Both of the radioactive substances were incorporated, within a few days, into walls of cells undergoing lignification at the time of the experiment. In contrast, *l*-glucosides were not converted by the plant. Photomicrographs are given indicating the presence and position of the radioactive substances.

826. SARKANEN, K., and SCHUERCH, C. **Conductometric determination of phenolic groups in mixtures such as isolated lignins.** *Analyt. Chem.* 27 (8), 1955 (1245–50). 41 refs. P.R.

A study of the effects of temperature, time, concentration, solvent and phenolic structure has resulted in the development of a technique suitable for soluble lignins and simple phenols. The results are accurate, except when very weak phenolic groups are present.

827. ADLER, E., and HERNESTAM, S. **Estimation of phenolic hydroxyl groups in [softwood] lignin. I. Periodate oxidation of guaiacol compounds.** *Acta chem. scand.* 9 (2), 1955 (319–34). 51 refs. [E.e.] O.R.S.

828. SMITH, D. C. C. **Ester groups in lignin.** *Nature, Lond.* 176 (4475), 1955 (267–8). 3 refs. [Low Temperature Research Station, Cambridge.]

The native lignin from sugarcane differs from other lignin in having a distinctive ultra-violet absorption spectrum which has now been shown to be due to the presence of *p*-hydroxycinnamic ester groups. This is only the second time that ester groups have been reported in a lignin. Native lignins from wheat straw, Douglas Fir wood and Horse Chestnut wood were examined for comparison. Only with wheat straw did the absorption spectrum show appreciable hydrolytic transformation of *N* NaOH and paper chromatography showed the presence of *p*-hydroxycinnamic acid and ferulic acid accompanied by traces of vanillic acid and syringic acid. Douglas Fir lignin yielded traces of *p*-hydroxybenzoic acid and vanillic acid; Horse Chestnut lignin, traces of vanillic acid, *p*-hydroxycinnamic acid and ferulic acid. It appears from the nature and distribution of ester residues in these cases that they are attached to pre-formed lignins, and so do not throw light on the basic structure of these substances.

829. WACEK, A., ZEISLER, F., and RIEGELMAYER, P. **The methoxyl content of Spruce.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 2543, 1955. pp. 30. 57 refs. Transl. by M. Slade from *Monatshefte für Chemie, Wien* 85 (3), 1954 (499–525). [See *For. Abstr.* 16 (No. 2197).] Limited distributon. P.R.

830. ADLER, E., and GIERER, J. **The alkylation of lignin ['native lignin' from *Picea abies*] with alcoholic hydrochloric acid.** *Acta chem. scand.* 9 (1), 1955 (84–93). 21 refs. [E.e.] [Chalmers Technical University, Gothenburg.] O.R.S.

831. PEW, J. C. **Nitrobenzene oxidation of lignin model compounds, Spruce wood and Spruce 'native lignin'.** *J. Amer. chem. Soc.* 77 (10), 1955 (2831–3). 10 refs. [Forest Products Laboratory, Madison, Wis.] O.R.S.

Comparison of the products of Spruce wood with lignin powder compounds indicates that a majority of the guaiacylpropane units are not limited by carbon substitution in the aromatic nucleus. The similarity in yield of products from lignin of Spruce wood and Spruce 'native lignin' suggests a close relationship between them. An appreciable amount of the diphenyl-type linkage appears to exist in coniferous lignin. *From author's summary.*

832. KAVANAGH, K. R., and PEPPER, J. M. **The alkaline nitrobenzene oxidation of Aspen wood and lignin model substances.** *Canad. J. Chem.* 33 (1), 1955 (24–30). 15 refs. O.R.S.

Yields of vanillin and syringaldehyde from Aspen wood and from model substances are compared and the results discussed with respect to the chemistry of Aspen lignin.

833. GAIO, F. VELOSO. Sobre a estrutura dos produtos florestais—a celulose. **[The composition of forest products—cellulose.]** *Publ. Serv. flor. aqüic. Portugal* 19 (1/2), 1952 (43–79). 51 refs. [Port.e.]

A general review based on world literature and including a table showing total cellulose, and cellulose and holocellulose contents of wood of 18 Portuguese species.

834. TIMELL, T. E. **Chain length and chain length distribution of native White Spruce cellulose.** *Pulp Paper Mag. Can.* 56 (7), 1955 (104–14). 53 refs.

Deals with the chemical and physical properties of the cellulose isolated almost quantitatively by direct nitration of the wood, the work of other investigators being discussed along with that of the author.

835. TACHI, I., and YAMAMORI, N. **[Hemicelluloses. VIII. The water-soluble polysaccharide of *Larix leptolepis* wood.]** *Journal of the Agricultural Chemical Society of Japan, Tokyo* 27, 1953 (139–44). [Jap.?] From *abstr.* in *Chem. Abstr.* 49 (13), 1955 (9270). P.R.

This polysaccharide, isolated in a yield of 3%, is identical with ϵ-galactan.

836. **[Oak heartwood and sapwood hemicelluloses.]** *Rep. For. Prod. Res. Bd., Lond. 1954*, 1955 (38).

The final hemicellulose product obtained by extraction from Oak heartwood in a yield of about 5% of the original wood weight was a white powder giving xylose (88%) and uronic acid on hydrolysis; that from the sapwood, yield about 5%, gave a blue colour with iodine, and yielded glucose, xylose and uronic acid on hydrolysis.

837. ROUDIER, A., and EBERHARD, L. Séparation des acides uroniques et aldobiuroniques formés dans l'hydrolyse partielle du bois de pin maritime (*Pinus pinaster* Soland). **[Separation of the uronic and aldobiuronic acids formed in partial hydrolysis of the wood of *P. pinaster*.]** *C.R. Acad. Sci., Paris* 240 (20), 1955 (2012–4). 7 refs. [F.f.] O.R.S.

838. **Fructose-containing oligosaccharides from Scots Pine.** *Rep. For. Prod. Res. Bd., London. 1954*, 1955 (38–9).

These substances were found in the wood from the pith to the outside of the tree for the whole length of the trunk. A detailed study will be undertaken.

813.2. Minor Organic Constituents. Extractives. Cell Contents

See also No. 814.

839. KRITCHEVSKY, G., and ANDERSON, A. B. **Occurrence of some simple sugars in heartwood of Port Orford Cedar (*Chamaecyparis lawsoniana*).** *J. Amer. chem. Soc.* 77 (12), 1955 (3391). 2 refs. [University of California.] O.R.S.

Arabinose, in crystalline form, was obtained from the water-soluble extract, and paper chromatography showed the presence of galactose, glucose and xylose.

840. ZAVARIN, E., and ANDERSON, A. B. **Extractive components from Incense-Cedar heartwood (*Libocedrus decurrens* Torrey). I. Occurrence of carvacrol, hydrothymoquinone, and thymoquinone.** *Repr.* from *Journal of Organic Chemistry, Baltimore* 20 (1), 1955 (82–8). 15 refs. P.R.

841. BACK, E., and CARLSON, O. T. **Composition of resin in chips and chipping sawdust from *Picea excelsa* pulpwood. Resin in parenchymatous cells and resin canals. 1.** *Svensk PappTidn.* 58 (11), 1955 (415–20). 7 refs. [E.sw.g.] P.R.

Data from accepted chips and rejected screening sawdust from 4 sulphite pulp mills are tabulated. The resin content of the sawdust was 3–10 times that of the chips, and that of its finest fractions was considerably higher than that of coarser fractions, especially for pulpwood stored on land. Free resin particles observed in the sawdust and attached to the chips are regarded, for morphological reasons, as deriving from resin canals, not from parenchyma cells. This 'canal resin' makes up the main part of the resin in the sawdust rejects, and its composition can be estimated from analyses of resin extracts of the fine fraction. The resin of the sawdust rejects contained about twice the proportion of free acids and esters contained in the chips. Similar results are expected for other *Picea* spp., and probably for *Pinus* spp.

842. KATHPALLA, Y. P., and DUTT, S. **Chemical examination of a crystalline lactone derived from the wood of *Dalbergia sissoo*.** *Indian Soap Journal, Calcutta* 18, 1953 (213–7). L.S.

Cf. *For. Abstr.* 15 (Nos. 1789–90).

843. CHADENSON, M., MOLHO-LACROIX, L., MOLHO, D., and MENTZER, C. Sur les constituants flavoniques du févier (*Gleditschia triacanthos*). **[The flavonic constituents [of heartwood] of *G. triacanthos*.]** *C.R. Acad. Sci., Paris* 240 (12), 1955 (1362–4). 10 refs. [F.f.] O.R.S.

844. KING, F. E., KING, T. J., and STOKES, P. J. **The chemistry of extractives from hardwoods. Part XIX. The structures of further new flavones occurring in Ayan (*Distemonanthus benthamianus*). Part XX. Distemonanthin, a new type of flavone from *D. benthamianus*.** *J. chem. Soc.* December, 1954 (4587–600). [University of Nottingham.] O.R.S.

Cf. *For. Abstr.* 13 (No. 4222).

845. KING, F. E., and JONES, G. **The chemistry of extractives from hardwoods. Part XXI. The structure of eperuic acid [from *Eperua falcata* and other *Eperua* spp. from British Guiana].** *J. Chem. Soc.* March, 1955 (658–65). O.R.S.

846. KING, F. E., GODSON, D. H., and KING, T. J. **The chemistry of extractives from hardwoods. Part XXII. The structure of diterpenes from *Vouacapoua* spp. [*V. americana* and *V. macropetala*.]** *J. Chem. Soc.* April, 1955 (1117–25). O.R.S.

847. KING, F. E., KING, T. J., and ROSS, J. M. **The chemistry of extractives from hardwoods. Part XXIII. The isolation of a new triterpene (terminolic acid) from *Terminalia ivorensis*.** *J. Chem. Soc.* April, 1955 (1333–7). O.R.S.

848. KING, F. E., BAKER, J. A., and KING, T. J. **The chemistry of extractives from hardwoods. Part XXIV. A saponin constituent of Makoré (*Mimusops heckelii*).** *J. chem. Soc.* April, 1955 (1338–42). O.R.S.

849. **Wood extractives. (1) Crystalline substance from Red Meranti [*Shorea* spp.]. (2) Coloured components of Indian Rosewood [*Dalbergia latifolia*] and Purpleheart [*Peltogyne* spp.]** *Rep. For. Prod. Res. Bd., Lond. 1954*, 1955 (40–1).

850. BARNES, R. A., and GERBER, N. N. **The antifungal agent from Osage Orange wood.** *J. Amer. chem. Soc.* 77 (12), 1955 (3259–62). Many refs. [Rutgers University, New Brunswick, N.J.] O.R.S.

The wood of *Toxylon pomiferum* [*Maclura pomifera*] has been found to contain about 1% of 2,3′,4,5′-tetrahydroxystilbene. This substance was toxic to 5 of 13 micro-organisms tested and is believed to be mainly responsible for the resistance of the wood to decay. *From authors' summary.*

851. ZIEGLER, H. Über die Lokalisierung der sauren Phosphatase im Holz des Spitzahorns (*Acer platanoides* L.). **[The localization of the acid phosphatase in the wood of *A. platanoides*.]** *Naturwissenschaften* 42 (9), 1955 (260). 3 refs. [G.] [Forstbotanisches Institut, München.] O.R.S.

The acid phosphatase was very active in some living, starch-storing wood parenchyma cells of the outer annual rings. These cells were identical with other cells in form, plasma structure and starch content. The phosphatase is considered to be responsible for the dephosphorylation of the hexose phosphates formed in starch phosphorolysis and the separation of sugars in the fibres. The investigation will be reported in more detail elsewhere.

814. Natural Durability. Old Wood. Fossilized Wood

See also Nos. 850, 941, 953–4, 960.

852. JACKSON, W. F. **Natural durability of Java Teak sleepers.** *Malay. Forester* 8 (3), 1955 (159–60).

Data on the durability of 5090 Java Teak (*Tectona grandis*) sleepers laid on Malayan Railways in 1927, inspected annually until 1941 and again from 1948, are tabulated with comparative data on Chengal (*Balanocarpus heimii*) sleepers. Teak proved markedly inferior to Chengal (26% rejected after 14 years, compared with 15%). The rejected Teak sleepers were found to suffer mainly from fungal decay and termites, attacks apparently associated with the 'boxed heart' included in all the sleepers, which were presumably cut from small trees. The Chengal, like all sleepers produced locally for the Malayan Railways, contained no boxed heart, and this may account for its superiority.

853. BEYER, A. F. **Some petrified wood from the Specimen Ridge area of Yellowstone National Park.** *Amer. Midl. Nat.* 51 (2), 1954 (553–76). 39 refs. B.A.P.

Describes 7 species of gymnosperms and 3 species of angiosperms. The following are new: *Pinus pseudotsugoides*, *Piceoxylon laricinoides*, *Abies lapidea*, *Thuja xantholitica*, *Libocedrus decurrenoides*, *Quercus rubida* and *Fagus grandiporosa*.

815. Effect of Growth Factors on Structure and Properties

See also Nos. 139, 795–7, 811, 987, 1002.

854. ALDRIDGE, F., and HUDSON, R. H. **Growing quality softwoods: a critical examination of the Turnbull hypothesis.** *Quart. J. For.* 49 (4), 1955 (260–70).

The authors resume their argument that quality in timber depends on rate of growth and not on the age at which the growth is made, discussing some of the literature on the subject. [Cf. *For. Abstr.* 16 (Nos. 4075–6).]

855. **[The relationship between silvicultural treatment and mechanical properties of plantation-grown Pine.]** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1953/54*, 1954 (91).

The data from a large number of tests on *Pinus taeda*, *P. caribaea* s.l., and *P. radiata* are being analysed, but already it is clear that density alone accounts for $> 80\%$ of the variation in strength of wood, and that density and age together account for nearly 90% of the variation. Rate of growth appears to have no significant effect on strength other than indirectly from its high correlation with both density and age.

82. Conversion, Shaping, Assembly and Finishing of Wood: General

See also No. 926.

856. **Research in machining.** *Rep. For. Prod. Res. Bd., Lond. 1954*, 1955 (17–8).

The conditions of test desirable in studying the blunting of wood-cutting tools are discussed. An improved form of dynamometer was constructed for measuring thrust and torque in boring. Loads borne by the various parts of a boring bit have been measured and some indication has been obtained of the varying resistance offered by wood to cutting during each revolution of a boring bit. A series of tests on quarter- and flat-sawn softwoods and hardwoods showed the torque to have a straight-line relationship to chip thickness and therefore to feed speed. A special machine was devised for sharpening boring bits to the degree of uniformity needed for tests to determine the relation of size of hole to power demand.

857. POLJANIĆ, N. Zaštitna tehnika u drvnoj industriji. (Mehanička prerada.) **[Safety measures in the wood industry. (Mechanical wood-working).]** Institut za Drvno-Industrijska Istraživanja, Zagreb. 1952. pp. 107. 21 refs. [Croat.] P.R.

Describes the dangers encountered and safety measures to be applied in the various wood-working operations.

858. **Saw mill and engineering: equipment at the Royal Show [Nottingham, 1955].** *Timb. Tr. J.* 214 (4113), 1955 (106–8).

Brief descriptions of a variety of equipment by English firms, including saws (forest and sawmill), winches and a jib-crane.

821. Barking

859. LIIRI, O. Tukkien koneellinen kuorinta. **[Log barking by machines.]** *Tied. Valt. tekn. Tutkimusl.* No. 136, 1955. pp. 179. 33 refs. [Fi.e.] P.R.

The construction, operating principles, and technical data of barking machines used in Finnish sawmills are reported, with information on capacity, breakdowns, power consumption, etc., based on practical experience. New machines, still under construction or at the design stage, and old and new machines from other countries are also described. Costs of barking in Finland are discussed. Information is given on methods and machines used in removing bark from slabs, edgings, and chipped wood, and on the use of bark. A number of barking machines not designed for use at sawmills and plywood factories are briefly described. [The English summary is purely indicative. There are many tables and illustrations, with Finnish legends, and an index to nearly 100 machines mentioned.] *From author's summary.*

822. Saws and Sawing

860. RUDNIK, JA. V. Proizvoditeljnostj lesopiljnyh ram s tolčkovymi podajuščimi mehanizmami. **[Efficiency of frame saws with intermittent-feed appliances.]** *Sbornik UkrNIIMOD, Kiev* 3, 1954 (32–54). [Russ?] From *abstr.* in *Prehl. lesn. Lit.* 6 (2), 1955 (No. 644). [Slovak.] P.R.

The output can be raised by increasing the speed of the frame, using swage-set teeth, and improving the alignment.

861. KNEŽEVIĆ, M. Pojednostavljeni način sastavljanja maksimalnog španunga. **[A simplified method of determining the spacing of frame-saw blades to obtain the maximum lumber yield.]** *Šumarstvo* 8 (5), 1955 (229–40). [Croat.e.g.]

[Cf. *For. Abstr.* 15 (Nos. 1812–3).] It is calculated that the variation of board thickness determined according to the theory of maximum-lumber-yield spacing has only a small effect on the ultimate yield %. Thus, with 6 flat-sawn boards from a log, a thickness variation of up to 0·03–0·04 r [log radius] is without any practical importance; for a greater number of boards this figure rises to 0·04–0·05 r. A simple method is derived for determining the optimum spacing of the blades, the total thickness of boards, including kerfs, being $(0{\cdot}9 \pm 0{\cdot}05)d$ [$d = 2r$], and the board thicknesses increasing from 18 mm. (the narrow outside boards) to a maximum of ca. 0·3–0·4r.

862. CHARDIN, A. L'emploi des scies alternatives pour le sciage des bois tropicaux. **[The use of reciprocating [frame] saws for milling tropical timber.]** *Bois For. Trop.* No. 39, 1955 (29–43). [F.f.e.span.]

Investigation of the various feed systems used with vertical frame saws shows that when high feed speeds are attained, the saw-teeth inevitably rub against the wood at the beginning of the upward

movement of the frame. This is the reason for the traditional design of the blades. Unfortunately both the friction and the blade design are incompatible with rapid sawing of hard and siliceous tropical timbers. The use of oscillating saw-frames may avoid both these obstacles. Another solution to the problem may be found in the use of a two-way sawing blade specially designed to avoid tooth friction. Blades of this pattern (illustrated by diagrams) have already been developed and experimented with, for milling very hard and extremely siliceous timbers. The conditions in which they can be fitted to either horizontal or vertical saws are analysed and discussed.

863. ANDREWS, G. W. **Sawing wood with circular headsaws.** *For. Prod. J.* 5 (3), 1955 (186–92). [Ottawa Laboratory, Forest Products Laboratories of Canada.]

Experiments were made at the research sawmill of the Ottawa laboratory on the effect of different factors on power requirements. The latter increased with increasing wood density, depth of cut (20 h.p. for a 4-in., 70 h.p. for a 12-in. cut), bite and tooth width. They also increased rapidly during the first 1000 bd. ft. sawn, after which the curve flattened out, indicating that the dulling of the teeth had become comparatively slow. Average power requirements for 19 Canadian timber species at a carriage speed of 170 ft./min. and saw speed of 700 rev./min. are tabulated, and graphs are given showing the relationship of carriage speed to h.p. and to work required at the saw (force and distance) for 3 saw speeds. In tests on 7 different types of saw-tooth, hollow-ground teeth with $\frac{1}{2}$-in. radius required least power and chipbreaker types most.

864. ENGLESSON, T., HVAMB, G., and THUNELL, B. Några resultat från undersökningar över med- och motsågning. **[Some results of research on 'up' and 'down sawing'.]** *Medd. svenska Träforsknlnst.* (*Träteknik*) No. 53*B*, 1954. pp. 14. 6 refs. [Sw.e.] (Also as *Medd. norsk tretekn. Inst.* No. 7.) P.R.

The main purpose of the investigation was to compare 'up' and 'down' ripsawing methods [cf. *For. Abstr.* 15 (No. 1814)] for circular saws in conditions that promote overheating, in an attempt to discover the reason for the rapid overheating occurring in 'up' sawing. Expressions for the relative movement between the saw teeth and the specimen have been evolved. The clearance angle (10°) on the teeth of the saws used was adequate, and overheating could not be caused by the wood rubbing against the top of the tooth. Expressions for the mean distance over which the sawdust is transported in the kerf, for various cutting depths and for each method of sawing, are also derived. With 'up' sawing the sawdust travels farther before it is cleared and there is more tendency for it to leave the gullet and to cause friction between the blade and the specimen than with 'down' sawing; this may be one cause of heat generation. The effect of the increase in cut per tooth from the point of entry in 'down' sawing and of the corresponding decrease in 'up' sawing is discussed; it is concluded that this could not cause significant overheating in 'up' sawing. Nor, with the feed speeds used (50 m./min.) could gullet clogging have done so. The value of the 'angle of attack' (the angle between the direction of feed and the front of the tooth) is plotted for the two sawing methods for various relative heights of the tooth point above the horizontal radius of the saw and for various values of ϕ—the hook angle + 90°. For a given hook angle the angle of attack is such that in 'down' sawing the teeth tend to break and tear, and in 'up' sawing to cut and pull the fibres. To secure the same action in 'up' sawing as in 'down' sawing, a negative hook angle of 15° is necessary. Further, with 'down' sawing the angle of attack is generally $< 180°$ and the force on the wood is opposed to the feeding force, while in 'up' sawing, using positive hook angles, the angle of attack is such that the force acts with the feeding force and the timber may be fed to the saw dangerously fast; with a decrease in the hook angle the rate can be reduced to a safe level. A study of photographs shows that, in 'up' sawing with normal hook angles, sawdust is projected across the gullet, at great speed, with a resulting escape of sawdust from the gullet, and overheating caused by friction; this did not occur with negative hook angles. A saw blade with negative hook angles cut without vibration or overheating. Power requirements using this blade in 'up' sawing were 50–70% more than for normal 'down' sawing, and the decrease in feed power of 70% did not balance this. A swage saw with positive hook angles could be used for 'up' sawing but it lacks cutting accuracy; with negative hook angles the accuracy was as good as for normal 'down' sawing with a positive hook.

865. ISAKOV, A. I. Povyšenie proizvoditeljnosti kruglopiljnyh stankov prodoljnogo raskroja. **[Raising the efficiency of circular rip-saws.]** *Sbornik UkrNIIMOD, Kiev* 3, 1954 (6–31). [Russ.] From *abstr.* in *Prehl. lesn. Lit.* 6 (2), 1955 (No. 645). [Slovak.] P.R.

Swaging of teeth reduces the power consumption by 35–40%, improves the quality of cut, and prolongs the service life of the saw. The effect of the number of teeth and their angles is shown.

823. Planing, Cutting of Mouldings. Chiselling, Mortising and Tenoning. Boring. Turning

See also No. 856.

866. KOCH, P. **An analysis of the lumber planing process. Part I.** *For. Prod. J.* 5 (4), 1955 (255–64). 15 refs.

Report of study of the peripheral-milling process of planing lumber. Relationships were determined between cutterhead h.p. and various combinations of specimen, cutterhead, and feed factors. Power-demand curves are interpreted by comparison with simultaneous 1-μsec. photos of chips. Secondary consideration is given to the quality of surface obtained. Cutterhead variables, feeds, and speeds are in the range of those commonly used in industry. *From author's summary.*

824. Forms of Joint. Jointing and Assembly

824.8. Glues and Gluing

867. **Report of Committee D-14. Adhesives.** *Prepr.* [*Proc.*] *Amer. Soc. Test. Mater.* No. 47, 1955. pp. 12. P.R.

Includes proposed tentative methods of test for: (1) susceptibility of dry, adhesive films to attack by cockroaches, (2) susceptibility of dry adhesive films to attack by laboratory rats, and (3) consistency of adhesives.

868. SMITH, N. F. **Adhesives in glued-laminated timber construction.** *For. Prod. J.* 5 (3), 1955 (168–74). 24 refs.

Advantages and limitations, types of glue and manufacturing methods.

869. OLSON, W. Z., and BLOMQUIST, R. F. **Polyvinyl-resin emulsion woodworking glues.** *For. Prod. J.* 5 (4), 1955 (219–26). 3 refs.

Evaluation of several polyvinyl resin emulsion glues currently available, and comparison with 11 glues tested in an earlier study. [See *For. Abstr.* 9 (No. 1694).]

870. NEWALL, R. J., and GROSERT, J. E. **Investigations into glues and gluing. Progress report 82 (superseding progress report 67 of Sept., 1952). Durability of assembly glues. Series B. Seventh-year report on laminated beams.** Forest Products Research Laboratory, Princes Risborough. 1954. pp. 6 + 3 dgms. Limited circulation. P.R.

Results are graphed and tabulated for the following glues: animal, casein, urea-formaldehyde and phenol-formaldehyde.

871. **Properties of adhesives [: relations between variations in manufacturing conditions of laminates and their behaviour in a cyclical durability test.]** *Rep. For. Prod. Res. Bd., Lond. 1954*, 1955 (20 + 1 plate).

Results are tabulated of delamination tests on laminations of Oak or African Mahogany, glued with resorcinol or phenolic glues, for different moisture contents, gluing temperatures and curing conditions during manufacture.

872. NEWALL, R. J., and DOMAN, L. S. **Investigation into glues and gluing. Progress report 85—June 1955. Behaviour of glued wood products in naval craft. Fifth year's analysis.** Forest Products Research Laboratory, Princes Risborough. 1955. pp. 6. Limited distribution. P.R.

873. **[Laminated bends of the types used in boat building.]** *Rep. For. Prod. Res. Bd., Lond. 1954*, 1955 (12).

A laminated bend of Oak 9 × 5 in. in cross-section was made, the resorcinol glue being cured in a period of 5½ hours by transverse R.F. heating. Certain practical difficulties involved in such an operation were overcome, and more uniform heating was obtained by applying the R.F. power parallel to the glue lines. It would probably prove uneconomical to employ R.F. heating for the total period in a large dimensional bend, and the possibilities of heating the bend to the required temperature by R.F. and completing the curing in a heated chamber have been investigated. The results of the tests so far indicate that it is not possible to obtain consistently good joints with English Oak and a resorcinol glue.

874. MCCORMACK, P. H. **Wood and metal combinations.** *For. Prod. J.* 5 (3), 1955 (174–6).

Glues and gluing, and bending properties of the assemblies.

875. MARIAN, J. E. **The correlation of 21 variables of the gluing process for wood and similar materials.** *Medd. svenska TräforsknInst.* (*Träteknik*) No. 68*B*, 1955. pp. 7 + 8 photos + 1 tbl. 9 refs. [E.e.] P.R.

A table is given showing the interrelationship of 21 variables (8 concerning the conditions during gluing, 8 the properties of the glue, and 5 the properties of the wood, including the direction of the glue line in relation to that of the fibres). Symbols indicate direct or inverse relationship between a pair of variables, or that there is no relationship. Examples of the use of this table are given.

876. **[Edge gluing of plywood.]** *Timb. Tr. J.* 214 (4123), 1955 (96–7).

A new machine developed by the Ederer Engineering Co., San Francisco, incorporates in one rigid unit a motor, conveyor bands, heating components and feed table, with push-button control, in 3 sizes for 4-, 8-, and 10-ft.-wide sheets, $\frac{1}{16}$-in. thick and upwards. There are 10 heating components, 5 above and 5 below the conveyor line, each having three 1000-watt infra-red tubes, these being separately removable and operable in any number combination.

877. LAMBUTH, A. L. **Gluing hardboard to [Douglas] Fir plywood with phenolic resin adhesives.** *For. Prod. J.* 5 (3), 1955 (177–9).

878. **Gluing of preservative-treated wood.** *Rep. For. Prod. Res. Bd., Lond. 1954*, 1955 (20–2).

Results showing the performance of glue lines in plywood of Gaboon or African Mahogany and in specimens of Beech pressure-treated with different preservatives before gluing are tabulated.

826. Peeling. Slicing. Trimming, Edging etc. of Thin Sheets

879. Es: Verbessertes Zurichten von Messerfurnierblöcken durch neue Drehvorrichtung. **[Improved positioning during the breakdown of logs for veneer slicing by a new turning device.]** *Holz-Zbl.* 81 (116), 1955 (1387). [G.]

Describes a superstructure to a log carriage, manufactured by E. Schulte, Hamm (W. Germany), in two sizes (for logs of 1·25 and 1·60 m. maximum diam.), in which the ends of the log are gripped between two chucks on a frame adjustable for lengths from 1·50 to 5·0 m. These chucks can be rotated mechanically through 45° or 90° at a time, the motor cutting out automatically when the exact angle is reached. Motors for operating the gripping device and for raising the log for a median cut also have automatic cut-outs. Increased speed and safety of operations are claimed, particularly with heavy exotic timbers.

827. Bending. Moulding (other than by Cutting)

See also Nos. 873–4.

880. STEVENS, W. C., and TURNER, N. **Equipment and methods used at the Forest Products Research Laboratory in wood-bending tests.** Forest Products Research Laboratory, Princes Risborough. No. [*W.B.*/16], (rev.) 1955. pp. 10. Limited circulation. P.R.

Illustrated description of the machines, tools and methods used for bending solid wood, laminated wood, and plywood.

881. **Bending tests.** *Rep. For. Prod. Res. Bd., Lond. 1954*, 1955 (12 + 1 photo).

Turkey Oak, Hornbeam, Field Maple and Sweet Chestnut all proved to have good bending properties if defective material was excluded; so did English-grown *Nothofagus obliqua*, although good bending material was scarce in the consignment tested, because of the prevalence of knots. R.F. heating has been used for localized softening of the part to be bent, in the manufacture of chairs having hairpin-type bends with straight legs; a special heating chamber was made for softening this part of the bending blank, along with an improved end-stop device on the bending machine. A suitable machine has been designed for bending several sticks for umbrella handles at the same time.

829.1. Finishing

882. ÉTABLISSEMENTS MARCEL MIGUET. Procédé pour la décoloration des bois. Procédé de décoloration des bois. [**Method of removing stains from wood.**] *French Patent* Nos. 1,047,313, Dec. 27, 1953, pp. 1; and 1,047,314, Dec. 27, 1953. pp. 1. [F.] P.O.

To bleach bluestained wood, an acid bath (<pH 2) is used, alone or preceded by immersion in oxidizing and reducing baths.

883. CIMBANENKO, E. G., ANNOŠČENKO, I. I., and KOSOVSKIĬ, G. N. Protravlivanie drevesiny s celjju imitacii pod cennye porody. [**Staining of wood to imitate expensive timbers.**] *Sbornik Ukr-NIIMOD, Kiev* 2, 1952 (153–62). [Russ.?] From *abstr.* in *Prehl. lesn. Lit.* 6 (2), 1955 (No. 676). [Slovak.] P.R.

Describes the apparatus and method used for the pressure-impregnation of Beech, Alder, Birch or Silver Fir (veneer, scantlings, logs) with aniline dyes at moisture content values of 10–60%.

884. FOLEY, T. A. **Knot sealer and paint service test on Radiata Pine weatherboards.** *N.Z. For. Res. Notes* No. 2, 1955. pp. 4 + 8 photos.

885. **Plastic compounds valuable in modern wood finishing.** *N.Z. Timb. J.* 2 (1), 1955 (37).

[Cf. *For. Abstr.* 14 (No. 2704).] Describes the Phenoglaze products, plastic compounds based on phenolic, urea and amine resins, (*a*) cold-setting, where the addition of a catalyst just before use is substituted for heating—(*a*1) Pheenalite clear, (*a*2) Pheenopol clear, (*a*3) Pheenorock; and (*b*) the thermo-setting Pheenalite white stoving enamel. These finishes do not support combustion: (*a*1) and (*a*2) are for furniture and are stated to be proof against heat, acid, alkali, alcohol, solvents, water, steam and grease, and resistant to abrasion; (*a*3) has been proved to be termite-proof at Dehra Dun, is teredo-proof and is specified by the Harwell nuclear fission group as a very good insulator, easily cleaned of radioactive particles. It will withstand immersion in hot and cold water and acids. A glass-like surface is given by (*b*), which stoves at the lower temperatures of normal stoving enamels and is useful for specialized work where protection against acids, alkalis and (to a high degree) heat, or against ingress by water, grease, blood etc., is required. The (*a*) compounds are supplied with the separate catalyst solution. They can be applied by brush or spray (30–35 lb./sq. in.). One or more coats with minimum drying of 30 min., are applied, the final one being allowed to dry for 24 hours before burnishing or matting. At room temperatures, the surface is cured in 7 days or less with slight elevation of temperature. Subsequent local damage to these surfaces requires only local treatment. Applications are floor blocks, bar counters, laboratory benches, table tops, ships' panelling. golf clubs, silk or nylon stocking formers, cash-register drawers etc.

886. **Wood panel finishing.** *Wood* 20 (8), 1955 (326–8).

Illustrates with photographs and sectional drawings the Saro Laminated Wood Products Ltd. workshop lay-out and method of automatic spraying and infra-red stoving of long runs of panels treated with liquid plastic 'Sar-Rez' finishes (transparent or opaque, fire-, acid- and alkali-resistant), which obviate the need for separate plastic sheeting. The stoving method was worked out by the General Electric Company.

83. Timber Manufacturing Industries and Products. Uses of Wood as Such

831. Fuelwood and Various Types of Rough Timber

See also Nos. 281, 767, 852, 934–7, 954.

887. WEBBER, L. E. **Beech for fuel and charcoal.** *Beech Utiliz. Ser. Ntheast. For. Exp. Sta.* No. 12, 1955. pp. 7. 5 refs.

Information, drawn from literature, on the properties of *Fagus grandifolia* for fuel and charcoal.

888. BANKS, C. H. **Testing wooden telephone and transmission poles for strength at the Forest Products Institute.** *J. S. Afr. For. Ass.* No. 25, 1955 (24–39). 8 refs.

Describes new methods capable of testing poles up to 50 ft. long and also composite H-frame structures (e.g. for carrying 88-KV lines), and tabulates the results of 2160 tests on 30 species, including 18 Eucalypts and 8 Pines. The minimum modulus of rupture in lb./sq. in. at 12% m.c. (the S.A. Standards rating) derived from these data gives the following classification: AA. 11,000—*Eucalyptus paniculata*; A. 8300–10,999—*E. citriodora, E. cladocalyx, E. cloeziana, E. maculata, E. maideni, E.*

microcorys, *E. resinifera*, *Pinus canariensis*; B. 5000–8299—*E. fastigiata*, *E. fraxinoides*, *E. pilularis*, *E. saligna*, *Pinus pinaster*, *P. radiata*. The application of this classification to the requirements of the General Post Office and the Electricity Supply Commission is shown. In the poles tested, increase of strength due to drying was small.

889. COUDREAU, J. La traverse en bois s'impose pour les chemins de fer de nos territoires tropicaux forestiers. **[Adequacy of wooden sleepers for railway lines in tropical forest areas of French overseas territories.]** *Bois. For. Trop.* No. 42, 1955 (41–54). 11 refs. [F.]

In most French overseas territories there has been a tendency to use concrete or steel sleepers. Sufficient knowledge is now available on the properties of local timbers and their preservative treatment, to show that they can advantageously replace the expensive and not wholly satisfactory steel and concrete. Examples of relative costs and durability are given.

890. CALLIA, V. W. Escadas extensíveis de Pinho do Paraná. **[Extending ladders of Parana Pine.]** *Publ. Inst. Pesqu. tec. S. Paulo* No. 509, 1954. pp. 7. [Port.]

Describes tests at the Instituto de Pesquisas Tecnológicas, São Paulo, to find suitable native woods for making extending ladders. It was established that a ladder could be made with stringers of laminated Parana Pine (*Araucaria angustifolia*) and rungs of Amendoim (*Pterogyne nitens*) that fulfilled the requirements laid down in the U.S. Federal Specifications for Ladders.

832. Mills, Their Functions and Products

891. JENTZSCH, H. Ein Beitrag zur Kenntnis der Entstehung von Silobränden in holzverarbeitenden Betrieben. **[The occurrence of woodwaste-bin fires in woodworking plants.]** *Holz Roh- u. Werkstoff* 13 (5), 1955 (193–5). 4 refs. [G.g.] P.R.

Recommends measures for preventing such fires.

832.1. Sawmills and Planing Mills

See also Nos. 729, 762, 858, 860–6.

892. En transportteknisk undersøkelse på stabeltomtene ved trelastbrukene. **[A study on transport techniques in the storage yards of timber mills.]** *Medd. norsk. tretekn. Inst.* No. 5, 1954. pp. 135. [Nor.e.] P.R.

Presents the results of investigations at 8 sawmills on: transport from saw to storage site; stacking the green timber; breaking down the stacks; transport of the dry timber from stack to planer or to external transport. Details are given of methods and equipment for manual and mechanical handling, times and costs (in 1952). The English summary has cross-references both to text paragraphs and to illustrations. The latter (listed, with English titles) include photographs of equipment and of manual work, graphs of times and costs for the different operations, and lay-outs of the mills. Tables include data on the mills studied, costs for the various methods of transport and stacking, and data on size and output of crews at the different mills.

893. MCBRIDE, C. F. **Losses incurred in drying and dressing lumber in the southern interior of British Columbia.** *For. Prod. J.* 5 (3), 1955 (200–3). [Vancouver Laboratory, Forest Products Laboratories of Canada.]

Results of studies, at different representative mills, of air and kiln drying and sawing of 4 softwood species. Results are tabulated, showing loss in volume and degrade during seasoning and manufacturing.

894. KOTOK, E. S., and MYERS, C. W. **An estimate of residues at a small sawmill in the Black Hills.** *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 17, 1955. pp. 6. 8 refs.

In a study on 61 logs, total residues equalled 112·3 cu. ft./1000 bd. ft. Solid residues (slabs, edgings and trims) totalled 48·6 cu. ft., half of the volume consisting of edging and trim. Sawdust amounted to 63·7 cu. ft./1000 bd. ft.

832.2. Veneer and Plywood Mills, including the Manufacture of Composite-Wood Assemblies

See also Nos. 737, 760, 779, 818, 867 *et seq.*, 879–80, 908–9, 944, 968–9, 1010.

895. **Trials of timbers for plywood manufacture. Progress report 26—June, 1955. Consignment No. 807. Dahoma, *Piptadenia africana*, Uganda. Consignment No. 811. Muchenche, *Piptadenia buchananii*, Uganda.** Forest Products Research Laboratory, Princes Risborough. 1955. pp. 11. Limited distribution. P.R.

896. **Trials of timbers for plywood manufacture. Progress report 27—June, 1955. Consignment No. 805. Abura (Nzingu), *Mitragyna stipulosa*, Uganda.** Forest Products Research Laboratory, Princes Risborough. 1955. pp. 14. Limited distribution. P.R.

897. **Trials of timbers for plywood manufacture. Progress report 28—June, 1955. Aningueria, *Aningueria altissima*, Uganda.** Forest Products Research Laboratory, Princes Risborough. 1955. pp. 12. Limited distribution. P.R.

898. SAKS, E. V. **Tropical hardwoods for veneer production in Mexico.** *Carib. For.* 15 (3/4), 1954 (112–9).

Notes on 28 Mexican woods, their grain, working properties and suitability for veneer production.

899. LUTZ, J. F. **Hickory for veneer and plywood.** *Hickory Task Force Rep. Stheast. For. Exp. Sta.* No. 1, 1955. pp. 12. 9 refs.

Data from the Forest Products Laboratory, Madison, on quality of test logs of Hickory and Pecan, heating the bolts and flitches for cutting, lathe settings, drying schedules and veneer yields, with discussion on properties and potential uses of plywood and veneer.

900. KAŠTALJAN, A. F. Izgotovlenie stroganoï fanery iz pilovočnyh breven duba, buka, oljhi, berezy i graba. **[Manufacture of sliced veneer from Oak, Beech, Alder, Birch and Hornbeam sawlogs.]** *Sbornik UkrNIIMOD, Kiev* 1950 (128–39). [Russ?]

From *abstr.* in *Prehl. lesn. Lit.* 6 (1), 1955 (No. 199). [Slovak.] P.R.

901. **An American veneer mill.** *Wood* 20 (9), 1955 (352–7).

A detailed description, illustrated by photographs and lay-out plan, of the veneer and saw mill of Chester B. Stem, Inc., of New Albany, Indiana, acknowledged as being one of the foremost of its kind. It incorporates automatic handling, electronic measuring and television control.

902. **The manufacture of veneer.** *Rep. U.S. For. Prod. Lab., Madison* No. 285 (rev.) 1955. pp. 8 + 4 photos. 7 refs. P.R.

903. CARRUTHERS, J. F. S. **Moisture relations of composite wood products. Progress report 27. The furrowing of veneered blockboards.** Forest Products Research Laboratory, Princes Risborough. 1955. pp. 8 + 3 dgms. Limited distribution. P.R.

The furrowing is shown to occur as a result of a change in moisture content.

904. BETHEL, J. S., and WOODRUM, W. B. **Increasing lumber core yields with a patched strip core.** *For. Prod. J.* 5 (3), 1955 (165–7).

Tests using patched cores of lower-grade lumber showed that patches do not show through on the face veneer, even when this is highly polished, in normally controlled operating conditions.

905. BEZZABOTNOV, M. M., and MASLOV, A. N. **[Reinforced wood laminate 'Arktilit'.]** *Gidrotehničeskoe Stroiteljstvo, Moskva* 22 (1), 1953 (24–7). [Russ.] From *abstr.* in *Holzforschung, Berlin* 9 (3), 1955 (94). [G.] P.R.

The new material (thickness from 1 to 45 mm.) consists of synthetic-resin-impregnated Birch veneer, metal wire, cotton fibres and cotton fabric; its density is 1·53 g./c.c., tensile strength 1360, compression strength 1584, and impact bending strength 112 kg./sq. cm. It is suitable for canal [conduit?] construction, etc.

906. GRANHOLM, H. Armerat trä. **[Reinforced timber.]** *Handlingar, Chalmers Tekniska Högskola, Göteborg* No. 154, 1954. pp. 96. [Sw.sw.e.f.] Price *Kr.*9. P.R.

Reports the results of an investigation on the possibility of reinforcing timbers with high-grade steel to obtain beams and girders suitable for practical engineering use. Details are given of the design of the construction, quality of steel and cross-section of the reinforcement, type of glue and quality of timber, and of laboratory and service tests.

832.3. Match Factories

See also No. 989.

907. **Matchwood.** *Rep. For. Dep. N. Borneo 1954*, 1955 (17).

Specimens of (1) *Anthocephalus cadamba*, (2) *Octomeles sumatrana*, and (3) *Macaranga* sp. (probably *M. gigantea*) were tested for suitability as match stock. Both (1) and (2) were too coarse and brittle for use as boxes or sticks: (3) was not good, but was better than the others; the wood stains when dried, and is not suitable for sticks, as it breaks easily.

833. Timber in Buildings and Engineering Structures (Manufacture and Use)

833.1. Building Components and Fittings: General

See also Nos. 906, 939.

908. BOYD, J. D., and PEARSON, R. G. **Notes on design stresses and procedures for glued laminated timber construction.** *Aust. Timb. J.* 21 (5), 1955 (390 . . . 408). 6 refs.

These detailed instructions are complementary to, and follow the same general plan as, the *Handbook of structural timber design* [see *For. Abstr.* 12 (No. 666)]. The practical experience of Europe and America has been drawn upon.

909. JORGENSEN, R. N. **Strength and elastic properties of two-species laminated wood beams.** *Bull. Pa. agric. Exp. Sta.* No. 595, 1955. pp. 41. 60 refs. P.R.

Presents the results of strength tests on test-pieces having a *Cordia alliodora* core and faces of one of 6 other species. The cores were from 1 to $1\frac{15}{16}$ in. thick and the faces, $\frac{1}{32}$ to $\frac{1}{2}$ in. It was found that a correction factor of 0·954 must be applied to the calculation of the effective modulus of elasticity from the equation originally developed for plywood. The calculated fibre stress at limit of proportionality of 2-species laminates, obtained by the transformed moment-of-inertia method, is ca. 20% greater than the test results. The calculated modulus of rupture obtained by the same method does not accurately predict the strength of most 2-species beams. [Cf. *For. Abstr.* 11 (No. 422).] *From author's summary.*

910. RADCLIFFE, B. M., and GRANUM, H. **A new low-pitched roof truss with nail-glued connections.** *Sta. Bull. Ind. agric. Exp. Sta.* No. 617, 1955. pp. 22. 4 refs.

A timber truss with gusset and splice plates glued in place behaves as a single unit under load. The stiffness of the truss is increased when the gusset plates are glued rather than fastened by nails or bolts; the strength is also increased. All the full-scale trusses tested behaved as predicted by model analysis. The results of various tests are tabulated and graphed.

834. Shingles. Cooperage. Packing Containers. (Manufacture and Use)

911. **Beer barrels.** *Rep. For. Prod. Res. Bd., London. 1954*, 1955 (12).

No difficulty was encountered in bending and assembling the components for barrels of Brown Sterculia (*S. rhinopetala*) but seepage took place from the completed barrels after filling.

835. Industrial and Domestic (Utility) Woodware. Toys and Models, Sports and Recreational Goods. Musical, Scientific and Mathematical Instruments. Surgical Applications etc.

See also No. 881.

912. CHAWLA, O. P. **Indian woods for battery separators. Manufacture and treatment of wooden battery separators for motor car lead-acid storage batteries, with special reference to the suitability of *Kail* (*Pinus excelsa*).** *Indian For. Bull.* (*n.s.*) No. 184, 1955. pp. 18. 7 refs.

Kail is not likely to give trouble in manufacture, and the yield of separators from the wood should be the same as that for *Abies pindrow* and *Picea morinda*, the approved timbers for the purpose. Separators made of *Kail* should not fail prematurely, though they are a little inferior to those of Fir and Spruce.

913. **Tennis racquet frames.** *Timb. Tr. J.* Ann. spec. issue, 1955 (175–7, 181). 1 ref.

Compares in detail the old hand-making with the present machine manufacture, using rotary veneers of Ash, Beech, Hickory or Birch bonded by high frequency with synthetic resins. Now 79% of the log is converted into useful products against 39% for the old sliced veneer method and time up to dried veneer has been cut from 6 weeks to 2½ days. The wedge piece is Mahogany or Sycamore.

836. Furniture and Cabinet-Making. Carving. Marquetry. Wooden Ornaments

See also Nos. 763, 881.

914. NAJERA Y ANGULO, F. L'utilisation du bois de peuplier en Espagne: son emploi en ébénisterie. **[The utilization of Poplar wood in Spain: its use in cabinet-making.]** [*Pap.*] *8th Sess. int. Poplar Comm., Madrid 1955*, No. *FAO/CIP/75-K Add-3*, 1955. pp. 7. [F.]

838. Vehicles (including Ships, Boats, Aircraft)

See Nos. 872–3.

839.1. Wood Wool and its Manufacture

915. SHEREBZOW [ŽEREBCOV]. Holzwolle als vollwertiger Ersatz für Werg beim Kalfatern. **[Wood wool as equivalent substitute for oakum in caulking.]** *Schiffbautechnik* 4 (8), 1954 (273–4). [G.] From *abstr.* in *Prehl. lesn. Lit.* 6 (2), 1955 (No. 664). [Cz.] P.R.

It is claimed that wood wool has certain advantages over oakum as far as incidence of rot is concerned.

839.8. Industrial Waste Wood, its Processing and Uses

See also Nos. 342, 841, 986, 1111.

916. CORNET D'ELZIUS, C. L'utilisation des déchets de bois. **[The utilization of wood waste.]** *Bull. Soc. for. Belg.* 62 (6), 1955 (273–98). [F.]

Report on a study tour of Germany, Austria, Belgium, France, Italy, and the U.K., organized by O.E.E.C.

917. MARCHISETTI, O. **Use of sawdust for firing bricks.** *Österreichische Ziegelzeitung* 4, 1954 (168). [G.] From *abstr.* in *Fuel Abstr.* 18 (2), 1955 (No. 1701). P.R.

Discusses the merits of using sawdust as substitute for coal in firing kilns, and considers the possibility of using sawdust as an admixture for producing lightweight products and for saving fuel.

918. GADOLLA, E., and PRUSCHA, H. Mischbrikett und Verfahren zu seiner Herstellung. **[Mixed briquettes and a method of manufacturing them.]** *Austrian Patent* No. 179,771. Oct. 11, 1954. pp. 1. [G.] P.O.

To make briquettes of brown coal or other coal that does not readily form briquettes, sawdust or other wood waste is added in proportion of 20–50%, and the mixture is subjected to a pressure of 1200–3000 atm.

919. WINKELMANN, H. G. **Wood burning.** *Unasylva* 9 (2), 1955 (64–6).

Extract from a bulletin (to be published shortly) on the techniques of wood burning and design of stoves.

920. LENGLEN. Les sciures de bois comme source d'humus. **[Sawdust as a source of humus.]** *C.R. Acad. Agric. France* 41 (10), 1955 (476–82). [F.] A.P.B.

Reviews briefly, with frequent references to literature, the history of the utilization of sawdust in France from the 18th century to the present day.

921. CHIPPENDALE, F. **Use sawdust with care.** *Qd. agric. J.* 78 (4), 1954 (199–200). O.R.E.

Damage to crops from sawdust mulches may be caused by N starvation, increase of termite population, essential oils and natural poisons, but chiefly by poisons used to preserve timber before conversion, borax and H_3BO_3 being the most dangerous, followed by pentachlorophenates and related substances.

922. LUNT, H. A. **The use of woodchips and other wood fragments as soil amendments.** *Bull. Conn. agric. Exp. Sta.* No. 593, 1955. pp. 46. 22 refs.

Studies were made over a 5-year period to determine the effect of Oak, Hickory, Aspen, Grey Birch and Red and White Pine, alone and in mixtures, for soil improvement, in greenhouse pots and outdoor frames and on field plots. The material was usually applied once and worked into the soil, with or without extra N. Results show that: (1) The material had no appreciable effect on soil acidity and was not toxic to plants, apart from causing temporarary N deficiency. (2) It had a small, generally favourable effect on soil structure, organic-matter content and associated soil properties. (3) Fresh chips almost invariably reduced growth of the first crop and were not consistent in their effect on succeeding crops, but when supplemented with enough N or composted, they did not diminish first crop yields and generally increased subsequent yields. (4) Chips are probably more effective on sandy soils than on loams, although very coarse-

textured soils may become excessively loose and open at first unless the chips are composted. (5) Birch chips decomposed more rapidly than either Oak or Pine and would require the most extra N, while Pine decomposed slowly and would require the least. Pine chips were generally more effective than Oak or Birch in improving the soil.

923. DAVEY, C. B. **Evaluation of composted fertilizers by microbiological methods of analysis.** *Repr.* from *Transactions, Wisconsin Academy of Sciences, Arts and Letters, Madison* 43, 1954 (93–6). 8 refs.

An attempt was made to detect the degree of 'ripeness' of composts by the determination of several microbiological characteristics, viz. rate of cellulose and protein decomposition, consumption of carbohydrates, population of aerobic organisms and the nature of compost-emitted volatile substances. The analyses were made on composted sawdust in 4 stages of decomposition: (1) untreated sawdust composted for 2 months, (2) similar sawdust treated with anhydrous NH_3, K_2SO_4, and H_3PO_4, examined 10 days after treatment, (3) as (2) but also inoculated with *Coprinus ephemerus*—examined 30 days after inoculation, and (4) as (3) but examined 90 days after inoculation. The results show that fully fermented sawdust compares favourably with hardwood/Hemlock leafmould. [Cf. *For. Abstr.* 16 (Nos. 2307–8).]

924. DAVEY, C. B. **Transformations of sawdust in the course of decomposition under the influence of *Coprinus ephemerus*.** *Proc. Soil Sci. Soc. Amer.* 19 (3), 1955 (376–7). O.R.E.

Sawdusts of *Pinus banksiana*, *Acer saccharum* and *Quercus borealis* were treated with anhydrous NH_3, neutralized with H_3PO_4, enriched with K_2SO_4, and then inoculated with *C. ephemerus*. Chromatographic analysis indicated that *C. ephemerus* is not selective in its sugar utilization, although it consumes hemicellulose somewhat earlier than cellulose. A chromatogram of the hydrolysate of *C. ephemerus* showed almost exclusively glucose. Cold-water extractables and alcohol/benzene solubles decreased during fermentation in Pine and Maple sawdust, but the latter increased in Oak sawdust. Oak and Maple sawdust showed an appreciable loss of holocellulose and lignin methoxyls, but a considerable increase in lignin. Pine sawdust failed to reveal a clear picture of transformations in its structural building blocks. The organism produced a consistent increase in the base exchange capacity of all 3 sawdusts investigated (nearly 100% in Pine) assuring its value in the preparation of soil-improving organic fertilizers. *From author's summary.* [Cf. preceding abstract.]

925. OVERHOLSER, J. L. **Sawdust mulches for larger crops, better soils.** *Rep. Ore. For. Prod. Lab.* No. G-5, 1955. pp. 4 + 2 photos. 6 refs.

Summarizes the results to date of experiments made jointly by the Departments of Horticulture, Soils and Bacteriology at Oregon State University and the Forest Products Laboratory.

84. Preservation and Other Treatments to Improve the Properties of Wood. Damage by Biological Agencies and its Control. Seasoning. Timberyard Practice

926. KOLLMANN, F. Technologie des Holzes und der Holzwerkstoffe. Zweiter Band. **[Technology of wood and of wood materials. Volume II.]** Springer-Verlag, Berlin. 2nd ed. 1955. pp. xvii + [1] + 1183 + 3 tbls. Many refs. [G.] P.R.

This volume of the new edition deals with wood preservation, surface treatment, seasoning and steaming, and improvement of wood; also with wood materials, wood working, bending and moulding, and wood joints. [Cf. *For. Abstr.* 13 (No. 2385).]

841. Wood Preservation

See also Nos. 767, 808, 878, 957, 968.

927. SANDERMANN, W., JONAS, G.-Z., and STOCKMANN, H. **Studies in the field of wood protection chemistry—fifth communication: The chemistry of the fixation of U- and UA-salts.** *Translation, Forest Products Research Laboratory, Princes Risborough* [1955]. pp. 7 + 2 dgms. + 3 gphs. Transl. from *Holz Roh- u. Werkstoff* 12 (8), 1954 (324–6). [See *For. Abstr.* 16 (No. 3498).] Limited distribution. P.R.

928. REUSSE, W., and ZAUBITZER, R. Physikalische Möglichkeiten zur Prüfung der Chrom-Arsen-Tränkung von Masten. **[Possibilities of testing the extent of impregnation of poles with Cr/As preservatives by physical methods.]** *Holz Roh- u. Werkstoff* 13 (6), 1955 (221–6). 4 refs. [G.g.] P.R.

X-ray photographs (30–35 KV) of disks 10–15 mm. thick provide the possibility of a qualitative picture of the spatial distribution of Cr/As preservative in wood. The mechanism of penetration can be advantageously studied when the impregnating solution contains an addition of $Na_2Cr_2O_7$ or $K_2Cr_2O_7$ with radioactive Cr ($_{24}Cr^{51}$). The distribution of the preservative can then be determined by means of special counters introduced into bored holes, or by special apparatus after the impregnated wood has been comminuted. It is also possible to apply activation analysis to impregnated specimens after irradiation in atomic piles.

929. SAKORNBUT, S. S., and MORRILL, H. L. **Detection of pentachlorophenol in treated wood.** *Analyt. Chem.* 27 (8), 1955 (1259–61). 5 refs. P.R.

Pentachlorophenol in treated wood was detected by formation of crystal violet. During colour development, oxidation by air was avoided, using N or CO_2. The minimum pentachlorophenol concentration detectable in treated *Pinus ponderosa* sapwood was estimated as 0·022%.

930. **Wood preservation: pressure impregnation with pentachlorophenol.** *Wood* 20 (6), 1955 (248–50).

States advantages, and gives solvents, plant layout, impregnation schedule, and recommended retentions for 17 end uses, both in and not in contact with the ground.

931. SCHMIDT, K., and IMHAUSEN, K.-H. (to Imhausen and Co. G.m.b.h. and K.-H. Imhausen)

Holzimprägnierungsmittel. **[Wood preservatives.]** *German Patent* No. 909,149, April 15, 1954. pp. 2. [G.] P.O.

The preservative (to be applied by brushing, or immersion with or without vacuum) includes a low-chlorinated naphthalene and substances forming a film preventing the evaporation of chlorinated naphthalene.

932. FARBENFABRIKEN BAYER. Produits pour la préservation du bois. **[Wood preservatives.]** *French Patent* No. 1,048,175, Dec. 21, 1953. pp. 2. [F.] P.O.

Example: 13·5% (by weight) of chlorinated diphenyl (60% Cl content) dissolved in 86·5% monochloronaphthalene. Chlorinated triphenyl, other liquid preservatives and solid preservatives (e.g. polychloronaphthalenes) can also be used.

933. BRAMHALL, G., and CONNERS, W. M. **Vapor pressures in Western Hemlock heartwood during boiling under vacuum in creosote.** *For. Prod. J.* 5 (4), 1955 (267–71). 11 refs.

Investigation showed that when Western Hemlock heartwood of various moisture contents (m.c.) was immersed in creosote at a constant temperature between 120 and 190° F., the vapour pressure increased as the m.c. increased. It also increased at any m.c. with rising temperature within the same range. *From authors' summary.*

934. **Wood preservation: railway sleepers and timbers.** *Wood* 20 (6), 1955 (244–7).

Details the development of the wooden sleeper and its preservation by the British Railways who now impregnate ca. 3,000,000 annually. Includes size and impregnation specifications, treatment schedules, history of imports, and species used.

935. BLUM A.-G. Verfahren zum Imprägnieren von Holzmasten in Trögen. **[Method of impregnating wooden poles in open tanks.]** *Swiss Patent* No. 295,761, March 16, 1954. pp. 2 + 1 dgm. [G.] P.O.

A sap-displacement method: the barked pole is subjected in a tank with a saline solution to an impregnating solution under pressure at one end and a vacuum at the other.

936. KAUFERT, F. H., REES, L. W., and NEETZEL, J. R. **Durability of pentachlorophenol treated fence posts.** *Minn. For. Note* No. 55, 1955. pp. 2.

The results of test under service conditions indicate that treatment of seasoned posts by cold-soaking in a 5% oil solution of pentachlorophenol is a simple, cheap method of increasing the durability of species tested, particularly Jack Pine, Black Ash, and Paper Birch, in which service life was increased from 3–4 years to 13 years.

937. BLEW, J. O. **Service tests on posts as a means of evaluating wood preservatives and methods of treatment. (Suggestions as to procedure that should be used in order to obtain the maximum benefits from service tests on treated posts.)** *Rep. U.S. For. Prod. Lab., Madison* No. 1726 (rev.) 1955. pp. 12 + 1 photo. P.R.

Cf. *For. Abstr.* 10 (No. 2782).

938. WANG, S. F. **[A comparative test on the decay durability of timbers treated with seven kinds of oil.]** *Bull. Taiwan For. Res. Inst.* No. 31, 1952. pp. 15. 12 refs. [Chin.e.]

Samples of *Pinus taiwanensis* and *Cunninghamia konishii* were inoculated with *Poria vaporaria* after impregnation with blue camphor oil, shogyu oil [from *Cinnamomum kanehirei*?] and its 'pitch', hinoki oil [from *Chamaecyparis obtusa*?] and its 'pitch', coal tar and creosote oil. The two latter gave much the best protection, shogyu oil none at all. The Pine decayed much more than the *Cunninghamia*, except when impregnated with coal tar and creosote. The chief tables have some English captions.

939. **Preservative treatment of building timbers.** *Timb. Leafl. For. Dep. Uganda* No. 25, 1955. pp. 8. 4 refs.

General instructions on the identity of borers, and protection against fungi, borers, and termites, based partly on F.P.R.L. Bulletin No. 24, with a list giving, in 7 categories, the permeability of the chief Uganda timbers.

940. **Preservative tests.** *Rep. For. Prod. Res. Bd., Lond. 1954*, 1955 (36).

Work has continued with the larval-transfer technique, using larvae (1·0–2·5 mg.) of *Anobium punctatum* and newly emerged larvae of *Hylotrupes bajulus*, and Scots Pine sapwood impregnated with fluor-chrome-arsenate at concentrations of 0·5, 0·18, 0·0675 and 0·025%. A minimum retention of 1·4 mg./c.c. of the water-soluble salt was needed to arrest development of *A. punctatum* at 22° C. and 85% relative humidity. First-stage larvae of *H. bajulus* survived for long periods at 25° and 75% in blocks treated with 0·25% of the preservative, but a concentration of 0·5%, equivalent to a retention of 3·8 mg./c.c., killed these larvae in 12 weeks.

941. ZUBIETA, G., and GOMEZ, C. E. Estudios comparativo de métodos utilizados en toximetria de preservadores de madera. I. Resistencia natural a decaimiento de *Eucalyptus leucoxylon* F. v. M. comparada con quebracho colorado. **[Comparative study of methods used in estimating the toxicity of wood preservatives. I. Natural resistance to decay of *E. leucoxylon* compared with *Schinopsis* sp.]** *Repr.* from *Industria y Quimica, Buenos Aires* 17 (2), 1955. pp. 6. 25 refs. [Span.] P.R.

[Cf. *For. Abstr.* 16 (No. 1064).] Three methods were tested: (1) the Leutritz method, (2) one using a malt-agar substratum, and (3) Badcock's method [cf. *For. Abstr.* 4 (36)]. Four fungi were used: (*a*) *Poria* sp., (*b*) *Polystictus sanguineus*, (*c*) one of the Polyporaceae, and (*d*) *Coniophora cerebella*. Of the 3 methods (2) proved the best for this type of test, except when (*d*) was the test fungus. The most effective fungi for the more resistant species (i.e. *Schinopsis* sp.) were (*c*) and (*d*). Attack by (*a*) varied according to the test method used, *Schinopsis* proving the more susceptible by methods (1) and (3), and the *Eucalyptus* by the method (2). In order, therefore, to check on variations in the behaviour of the test fungi, it is as well to include for comparison in the tests a third, very susceptible wood speciet. It is also advisable to use as many kinds of tess

fungus as possible. The results permit *E. leucoxylon* and *Schinopsis* sp. to be classed respectively as 'durable' and 'very durable'.

942. CARR, D. R. **Comparative tests with wood preservatives.** *Tech. Pap. N.Z. For. Serv.* No. 4, 1955. pp. 48 + 8 plates. 13 refs.

Comparative tests of the relative effectiveness and permanence of certain wood preservatives under New Zealand conditions on New-Zealand-grown *Pinus radiata* are described. The tests employed were accelerated graveyard tests, artificial weathering or leaching in conjunction with wood-block-soil decay tests, natural weathering, and corrosion tests. The preservatives used were: (*a*) $ZnCl_2$, (*b*) $ZnSO_4$, (*c*) NaCl, (*d*) borax, (*e*) Na pentachlorophenate, (*f*) chromated $ZnCl_2$, (*g*) copperized chromated $ZnCl_2$, (*h*) acid copper chromate, (*i*) Zn-Cr arsenate, (*j*) Cu-Zn-Cr arsenate, (*k*) copper chromate-arsenate mixtures, (*l*) Zn $(AsO_2)_2$, (*m*) Cu arsenate, (*n*) fluor-chrome-arsenate phenol, (*o*) PCP, (*p*) Cu napthenate, (*q*) creosote (two types), (*r*) tar oil, (*s*) creosote/fuel-oil mixtures.

Preliminary results indicate that the fuel-oil tested has no preservative value. Creosote in retentions higher than 5 lb./cu. ft. is essential for the preservation of timber in contact with the ground. Of the oil-soluble preservatives tested, (*p*) does not protect against *Poria vaporaria*; significant losses of (*o*) can occur from treated timber, in spite of its low solubility in water. Of the water-soluble preservatives, (*a*), (*b*), (*c*) and (*d*) leach rapidly. Where no leaching occurred, (*d*) showed high fungicidal properties. With the multi-salt preservatives, the resistance to leaching of the various components is relative rather than absolute. All showed resistance, but two components of (*n*) showed high leaching losses. The most satisfactory results were obtained with (*j*), which was very resistant to leaching and effective against all fungi. Timber treated with (*h*) was very resistant to leaching, but was attacked by *P. vaporaria*. Timber treated with (*n*) and (*i*) was attacked by *Lenzites trabea*. *From author's abstract.*

943. COLLEY, R. H. **A weathered laminated test stake technique for evaluation of wood preservatives.** *For. Prod. J.* 5 (4), 1955 (272–6).

Defines some basic principles underlying the evaluation of wood preservatives for land exposure, and describes a stake-test technique that may be useful in applying these principles. Specially chosen and prepared test plots are recommended and a weathered, laminated test 'stake', consisting of individual gradient retention sticks is described and illustrated. Incidence and degree of decay are first determined by laminated pilot or indicator stakes.

842. Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies other than Fire

944. NARAYANAMURTI, D., and KAUL, R. K. **Studies on improved wood: part VIII—heat stabilized laminated wood from Indian timbers and factors affecting improvement in properties.** *Comp. Wood* 2 (2), 1955 (33–8). 4 refs. P.R.

Presents results of experiments with 9 Indian species. Strength properties are tabulated and graphed for 'Staypak'-like products obtained at 160°–165° C. using only one veneer thickness, in relation to the pressure applied. [Cf. *For. Abstr.* 12 (No. 1280).]

945. STAMM, A. J., BURR, H. K., and KLINE, A. A. **Heat-stabilized wood (Staybwood).** *Rep. U.S. For. Prod. Lab., Madison* No. 1621 (rev.) 1955. pp. 8 + 9 gphs. P.R.

Cf. *For. Abstr.* 8 (No. 1895).

946. GOLDSTEIN, I. S. **The impregnation of wood to impart resistance to alkali and acid.** *For. Prod. J.* 5 (4), 1955 (265–7). 4 refs.

Describes a process developed for impregnation with furfuryl alcohols. Their effects on wood properties are discussed, and uses for treated wood are listed. *From authors' summary.*

843. Fireproofing and Fire Resistance

947. NIELSEN, M. L. (to Monsanto Chemical Co.) **Phosphorus oxychloride and ammonia reaction products in flame-retarding compositions applied to cellulosic materials.** *U.S. Patent* No. 2,661,263, Dec. 1, 1953. pp. 6. 6 refs. P.O.

844. Attack by Plant Organisms

844.1. Sap-staining and Mould Fungi

See also Nos. 470, 555, 567, 882, 988.

948. LEKANDER, B., and RENNERFELT, E. Undersökningar över insekts- och blånadsskador på sågtimmer. **[Investigations of damage caused by bark-beetles and bluing fungi in sawtimber.]** *Medd. SkogsforsknInst., Stockh.* 45 (8), 1955. pp. 36. 12 refs. [Sw.sw.e.] Price *Kr.*2.

The most important bluestain fungi, spread in the air or by insects, and the most important insects causing technical damage and transmitting bluestain in Pine and Spruce, are discussed. An examination of sawtimber (977 Pine and 277 Spruce logs) during 1950–52 at the mill at Skutskär, Uppland, showed that Pine was attacked mainly by *Blastophagus piniperda* and *B. minor*, and Spruce by *Trypodendron lineatum* and *Ips chalcographus*. Bluestain was much heavier in 1951 than in 1953; it developed more slowly on the under than the upper side of logs. A storage experiment was carried out with Pine logs in the Falun district, Dalarna. The following are the most important results, based mainly on grade yields of sawn timber: (1) Bluestain caused more damage than insects and was introduced mainly by *B. minor*. (2) Attack was much less in large, loosely stacked piles at the lake-side than in small piles in the forest. (3) Further development of insects and bluestain was prevented by launching in the water early in the season. (4) Damage during water storage or floating was of minor importance. (5) Damage by bluestain was heavier in patch-barked than in unbarked logs, and increased more in the former as a result of late launching. (6) Spraying with a DDT solution at the cost of about 24 öre per log prevented degrade by insects or bluestain.

949. RIBALDI, M. Ricerche sulle alterazioni cromatiche di legname di *Picea excelsa* Lk. in Val Canale (Udine). **[Staining of *Picea abies* timber in Val Canale (Udine).]** *Bollettino della Società Italiana di Biologia Sperimentale, Napoli* 27, 1951 (653–5 + 1 plate). 6 refs. [It.] L.S.

Two staining fungi were isolated—*Ophiostoma* (*Endoconidiophora*) *coerulescens* and *Graphium penicillioides*).

950. **Sap-stain investigations.** *Rep. For. Prod. Res. Bd., Lond. 1954*, 1955 (30–1).

In material infected in the laboratory by *Diplodia* spp., which cause sap-stain in many tropical woods, the fungus was killed when subjected to 55° C. for ½ hr., and survived for 4, but not 16 hours at 51–52°. It was rather more resistant, surviving to ½ hour at 60°, in naturally-infected wood in which its mycelium was probably more mature. It is probably necessary to expose hardwoods stained with *Diplodia* to 65° for at least 1 hour to ensure killing the fungus throughout the piece. *D. theobromae*, in sticks of *Gonystylus* spp. 15 cm. long and coated with wax to prevent superficial growth, penetrated the whole length along the grain in 19 days at 22°.

951. COSTA, E. W. B. DA. **Effect of blue stain on the strength of *Pinus radiata*.** *For. Prod. News Lett. C.S.I.R.O. Aust.* No. 209, 1955 (1–2).

The most common bluestain fungus in Australia is *Diplodia pinea*. After exposure to this and to 4 other fungi for 12 weeks under laboratory conditions, the bending and impact strength of the timber was tested, in both the green (m.c. 140–150%) and the dry (m.c. 10–15%) state. No significant decrease was observed in either bending or impact strength though results overseas generally show a marked reduction of the latter.

844.2. Wood-destroying Fungi

See also Nos. 470, 555, 559–62, 850, 938, 941–2, 988.

952. WALTERS, N. E. M. **Project P.11. The characteristics of Australian decay and stain fungi. Sub-project P. 11–6. Taxonomy of Australian basidiomycetes. Progress report No. 1. Herbarium notes on species of *Coltricia* and *Inonotus*.** Division of Forest Products, C.S.I.R.O., Melbourne. 1955. pp. 20 + 6 plates. 28 refs.

953. KHAN, A. H. **Decay in timber, its cause and control.** Pakistan Forest Research Institute, Abbottabad. 1954. pp. 29 + 8 photos. 52 refs.

Includes tabulated data on (1) the principal rot fungi occurring in Pakistan, and (2) the natural durability of the principal indigenous timber species as determined by graveyard tests.

954. ENGLERTH, G. H., and SCHEFFER, T. C. **Tests of decay resistance of four western pole species.** *J. For.* 53 (8), 1955 (556–61). 4 refs.

Cf. *For. Abstr.* 16 (No. 3532).

955. **Physiology of wood-rotting fungi.** *Rep. For. Prod. Res. Bd., London. 1954*, 1955 (26–9).

Nine species of micro-fungi, including *Chaetomium funicola* and *Bispora pusilla* have been shown to cause soft rot under laboratory conditions [cf. *For. Abstr.* 16 (No. 2375)]. Soft rot developed in Beech strips with a moisture content of only 20% and kept for 2 years freely exposed in a chamber at 25° C. and 90% relative humidity. A definite ratio was found between amount of available nutrient salts, especially N and P, and amount of decay caused by *C. globosum*. Results of experiments with *C. globosum* on Beech sawdust soaked in varying concentrations of Abrams medium are shown in a graph. Very rapid decay was obtained by exposing Beech veneer 0·4 mm. thick on Abrams agar, the ultimate loss in weight (88%) suggesting that some lignin is ultimately removed. Blocks of Beech embedded in a moist soil/peat mixture to which a small amount of balanced fertilizer had been added, decayed more rapidly than in the same soil mixture without fertilizer.

956. FAGAN, M. S. **A chemical study of the nutritive composition of the wood-rotting fungi, *Polyporus palustris* and *Daedalea quercina*.** *Abstr. of thesis*, in *Dissert. Abstr.* 15 (5), 1955 (687). [Syracuse University.] O.R.S.

Gives particulars of the protein content, amino acids synthesized, and fat, fibre and mineral contents of mycelia of the two fungi on 6 different media. The protein, fat, fibre and mineral contents were related to the growth medium.

957. **Dry rot investigations.** *Rep. For. Prod. Res. Bd., Lond. 1954*, 1955 (30).

Various chemicals have been tested for sterilizing infected walls. 0·8% Na PCP solution, 0·1% $HgCl_2$, 2% phenyl mercuric di-naphthyl-methane-disulphonate, 0·1% tri-ethyl tin hydroxide, a number of proprietary preparations of organic Hg compounds and Cu-8-quinolinolate were all effective in preventing overgrowth of test pieces of mortar by the fungus. Wood thoroughly soaked in sea water shows appreciable increase in resistance to dry-rot fungi, but resistance of wood merely wetted with sea water is not increased. However, wood impregnated with sea water is more hygroscopic than normal wood and would attain a moisture content suitable for fungus growth in a less humid atmosphere.

958. RICHARDS, M. **The indoor dissemination of dry rot spores.** *International Archives of Allergy and Applied Immunology, New York* 4 (5), 1953 (360–5). 9 refs. [St. David's Hospital, Cardiff.] L.S.

The 'gravity slide' method was used and showed that considerable numbers of spores were readily carried by air through a moderately large (4-storey) house.

959. FRANKLAND, A. W., and HAY, M. J. **Dry rot as a cause of allergic complaints.** *Acta Allergologica, København* 4 (2), 1951 (186–200). 28 refs. [St. Mary's Hospital, London.] L.S.

Out of 100 allergic patients 20 were positive in clinical trials, using skin tests. Allergic symptoms could be produced experimentally at any time in a known sensitive patient by inhalation of dry-rot spores.

845. Attack by Animals

845.1. Marine Borers

960. WOODS, R. P. **Marine borer tests.** *Wood* 20 (6), 1955 (220–2).

Notes on the resistance to *Teredo* spp. of 20 tropical timbers at Shoreham harbour, Sussex, set and examined on various dates in 1951–55.

961. EVERHART, E. W., and PRYOR, M. J. **Wooden piling is protected by metal sheathing in series of tests which have indicated its effectiveness.** *Lumberm.* 82 (9), 1955 (67, 113).

Panels of aluminium alloys exposed between high and low water marks in the Duwamish Waterway were encrusted by barnacles at the end of 3 years but undamaged by them. These alloys are not attacked by teredos.

962. REISH, D. J. **Polychaetous annelids as associates and predators of the crustacean wood borer, *Limnoria*.** *Wasmann Journal of Biology, San Francisco* 12 (2), 1954 (223–6). 2 refs. O.R.S.

Two species out of 6 found in *Limnoria*-infested wood pilings from Coos Bay, showed evidence of having eaten *L. lignorum*, and 3 species of 8 from infested wood in Los Angeles harbour evidence of having eaten *L. tripunctata*.

845.2. Terrestrial Borers

See also Nos. 470, 637, 641, 647–8, 940, 948.

963. **Investigations on infestation [by *Anobium punctatum*] in sound wood.** *Rep. For. Prod. Res. Bd., Lond. 1954*, 1955 (33–4).

Sapwood from freshly felled Corsican Pine was divided into 3 zones and exposed for egg-laying. After 20 months it was found that suitability for larval development decreased from the outer zone inward; these results may be related to a decreasing N gradient from the periphery similar in order to that obtained for larval weight across the 3 zones. Acetone extraction of the outer zone had little effect on susceptibility to attack; prolonged soaking in water at 60° C. greatly reduced it, and at 100° had even more effect. The chemical effect of the water extractions is not fully understood. Results of an egg-laying preference test on English Oak extracted with water at 60 and 100°, with acetone and ether, showed that in sapwood little choice is made between extracted materials but that unextracted controls are preferred, whereas in heartwood, extracted material is preferred.

964. ***Lyctus*: the powder-post beetle *Lyctus brunneus* Stephens).** *Pamphl. For. Comm. N.S.W.* No. 12, 1955. pp. 8.

A pamphlet indicating methods of recognizing, preventing, and controlling *Lyctus* damage to wood.

965. KAMP, H. J. Nutzholzschädlinge an Eiche und ihre Bekämpfung. **[Timber insect pests on Oak and their control.]** *Merck Blätter, Darmstadt* 4 (1), 1954 (1–14). 26 refs.

An account of trials in the S. Palatinate against *Platypus cylindrus*, *Xyloterus signatus* and 8 other beetles. Of 9 poisons tried, on Oak logs in semi-shade and stumps in the open, only the BHC preparations Viton oil concentrate, diluted 1 : 9 in diesel oil, and Mobe-T undiluted, and Multanin Ultra with 90% active ingredient in 5% solution, gave 90% protection for 7 weeks, which is considered too little and too expensive except for very valuable timber.

845.3. Termites

See also Nos. 71–4.

966. SCHMIDT, H. [Editor]. Die Termiten: ihre Erkennungsmerkmale und wirtschaftliche Bedeutung. **[Termites: their identification and economic importance.]** Akademische Verlagsgesellschaft Geest and Portig K.-G., Leipzig. 1955. pp. 309. [G.] Price *DM* 32 [£2. 15*s.* 9*d.*].

Anatomy, systematy and distribution of termites (*H. Weidner*; pp. 5–81; 71 refs.); Termite nests (*H. Weidner*; pp. 82–120; 26 refs.); Swarming and the founding of colonies (*A. Herfs*; pp. 121–30; 13 refs.); Termites and plants (*A. Herfs*; pp. 131–59; 31 refs.); Control of termites damaging plants (*H. Weidner*; pp. 160–4; 11 refs.); The use of *Calotermes flavicollis* for research (*K. Gösswald*; pp. 165–92; 39 refs.); Damage to timber (*H. Schmidt*; pp. 193–207; 51 refs.); Preservatives (*W. Sandermann*; pp. 208–44; 66 refs.); Natural resistance of woods to termite attack (*W. Bavendamm*; pp. 245–306; 71 refs.).

967. **Termites and their control [in New South Wales].** *Pamphl. For. Comm. N.S.W.* No. 15, 1954. pp. 16.

A pamphlet indicating methods of recognizing, preventing, and controlling termite damage to wood.

968. **Termite investigations.** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1953/54*, 1954 (68–9).

Plywood made from Karri (*Eucalyptus diversicolor*) can be effectively termite-proofed by momentary dipping of the veneers in suitable preservative solutions such as Na pentaborate, or a mixture of $ZnCl_2$ and As_2O_5 before bonding.

846. Steaming

969. PLATH, E., and PLATH, L. Papierchromatographische Untersuchungen an Dämpfkondensaten von Rotbuche. **[Paper-chromatographic investigations of the water of condensation obtained during the steaming of Beech [logs].]** *Holz Roh- u. Werkstoff* 13 (6), 1955 (226–37). 30 refs. [G.g.] P.R.

Sugars (*l*-arabinose, galactose, glucose, xylose, rhamnose), uronic acids and lignin constituents have been found by means of paper chromatography in the water of condensation from the steaming of Beech logs in veneer manufacture (temperature 80–100° C., steaming time 0–100 hours), the proportions of these substances varying with temperature and duration of steaming. It is concluded that wood pectins and some lignin constituents are extracted in the first place, i.e. it is the middle lamella that loses most of its 'cementing' substance, thus improving the sliding of the fibres. If too much of the pectins and hemicelluloses is lost, the veneer becomes 'woolly' (individual fibres being loosened); still longer steaming causes disintegration of wood along the growth-ring boundaries.

970. DAŠKOVSKIĬ, A. F. Proparka bukovyh pilomaterialov. [**Steaming of converted Beech wood.**] *Sbornik UkrNIIMOD, Kiev* 2, 1952 (58–82). [Russ.?] From *abstr.* in *Prehl. lesn. Lit.* 6 (2), 1955 (No. 608). [Slovak.] P.R.

Graphs and tabulates the following results: effect of steam pressure on steaming and variation of the moisture content; steam consumption and time of steaming for different dimensions; rate of kiln heating for loosely and densely stacked material.

847. Drying (Seasoning)

See also Nos. 813, 970.

971. SERGOVSKIĬ, P. S. **Mechanism of the movement of moisture in timber during convection drying.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 2568, 1955. pp. 13 + 5 gphs. 10 refs. Transl. by M. Slade from *Derev. lesohim. Prom.* 3 (4), 1954 (3–8). [See *For. Abstr.* 16 (No. 2402).] Limited distribution. P.R.

972. BOLLMANN, L. Beschleunigte Freiluft-trocknung. [**Accelerated air-drying.**] *Holz-Zbl.* 81 (98), 1955 (1173–4). [G.]

Describes a mobile axial fan, equipped with moisture- and airstream-controls for the speedier drying of stacks in timber yards etc. A graph shows drying times for 50-mm. Oak boards of 0·63 air-dry density from 68 to 28% m.c. At an average day-temperature of 10° C. and average humidity of 64%, drying time was 1080 hours, with the fan in operation for 540 hours (i.e. 12 hours daily) against 1980 hours for unaided drying, and 160 hours in a walled kiln at 40° C. Current consumption was 81 KWH/cu.m. The fan should not be used at night in cold weather.

973. **Kiln seasoning.** *Rep. Conserv. For. Ceylon 1954, Part 2*, 1955 (9–10).

Experiments have been made in kiln seasoning of Hora [*Dipterocarpus zeylanicus*], Milla [*Vitex pinnata*], and Ranai [*Alseodaphne semecarpifolia*], and tentative schedules are given. Case hardening was in all cases relieved by steaming.

974. **Kiln drying of Ramin (*Gonystylus* spp.).** *For. Prod. News Lett. C.S.I.R.O. Aust.* No. 209, 1955 (3).

Gives schedules, (*a*) recommended, for quarter-sawn 1-in., and (*b*) tentative, for back-sawn 2-in. stock, to dry from 45–50% m.c. down to 12%, the former in 2–3, the latter in 8–9 days. Quarter-sawn 2-in. stock can be dried under (*a*) in 6 days.

975. MCMILLEN, J. M. **Drying stresses in Red Oak: effect of temperature.** *For. Prod. J.* 5 (4), 1955 (230–41). 9 refs.

Compares the effect of kiln drying at 80–140° F. and room drying at 35–80°, on tensile and compressive stresses ⊥ in 2-in. Red Oak. Increases in temperature increase the maximum tensile strain in the outside layers at the start of drying, and the maximum tensile strain in the centre layers after stress reversal. The maximum compressive stress in the centre layers remained nearly the same at almost all temperatures; but it was considerably lower at 140°. The greater compression set in the centre layers at higher temperatures caused a greater board shrinkage. *From author's summary.*

976. EDDY, A. A., and GRAHAM, R. D. **The effect of drying conditions on strength of coast-type Douglas Fir.** *For. Prod. J.* 5 (4), 1955 (226–9). 6 refs.

Comparison between air drying, kiln drying and drying in organic vapours (trichloroethylene, xylene, percholorethylene) of specimens from the same material, showed that: (1) drying time was shortest for organic vapours at 225–250° F.; (2) the equilibrium moisture content decreased as the drying temperature increased, being highest for air-dried specimens, and lowest for wood dried in organic vapours at 250°; (3) the modulus of elasticity and compression ⊥ were not affected by drying conditions, work to limit of proportionality and hardness were affected only at 250°, and the modulus of rupture and work at maximum load were affected at 190–250°.

977. COMBEN, A. J. **The effect of high temperature kiln-drying on the strength properties of timber.** *Wood* 20 (8), 1955 (311–3). [Forest Products Research Laboratory, Princes Risborough.]

The strength in impact bending, static bending and compression, of *Triplochiton scleroxylon*, *Mitragyna stipulosa*, and *Pinus sylvestris*, was virtually unaffected by rapid superheated-steam drying at 110° C. as compared with that of the same timber dried by normal F.P.R.L. schedules. In Mahogany (*Khaya ivorensis*) treated relatively severely, there was a reduction in toughness and impact strength and an increase in brittleness. Kiln schedules are tabulated. A second table gives the strength data expressed as a % of those of the normally dried timber.

978. LADELL, J. L. **High temperature drying of lumber.** *Timber of Canada* 15 (11), 1955 (19–22, 46). 5 refs. [Forest Products Laboratories of Canada.]

Former trials at Ottawa [cf. *For. Abstr.* 14 (No. 3912)] showed an unacceptably wide range of moisture content (m.c.) in the dried stock, and preliminary tests with the new kiln, which is described in detail, are concerned with the effect on this of circulation rate and of hourly reversal of the direction of flow. Charges (3 ft. wide) of 1-in. Eastern White Spruce were put through the kiln with the dry and wet bulbs held at 240° and 200° F. respectively, relative humidity (r.h.) 47%, equilibrium m.c. 3·9%. All charges were similarly conditioned for 1½ hours after drying. Six runs were separately subjected to air flows of 400, 600 and 900 ft./min. either in a single direction or reversed hourly. A table summarizing the data gives the % of boards with final m.c. 1, 2, 3, 4 and 10% above the mean for the charge. This shows that at ca. 500 ft./min. there is a critical rate below which the range of final m.c. is excessive. A table shows the drop in temperature across the pile for single-direction circulation, for flows of 400 and 900 ft./min. These differences rise above the maximum of 5° considered critical for uniform drying. With the highest flow rate and periodic reversal (which halves the drop) the difference

remained below 5° F. for most of the run and very uniform drying resulted.

There was little to choose between the excellent quality of the stock for the various treatments. Deformation, discoloration and checking were slight, and the first had no discernible increase from the higher circulation rates. These cost < 20% more in power but saved 40% of kiln time in comparison with the lowest flow rates.

979. KEER, G. A. **The future of kiln drying.** *Wood* 20 (6), 1955 (223–6). 26 refs.

Contains brief descriptions of dielectric, infra-red, vacuum, vapour and superheated-steam drying and solvent and chemical seasoning. It is concluded that the conventional kiln will lead for some time in quality, capacity and cheapness. Improvement lies in better drying technique, higher final temperature, faster air circulation, more automatic control, and the training of operators.

980. FIELD, P. **A new direct heat exchanger for kiln drying lumber.** *For. Prod. J.* 5 (3), 1955 (204–5).

Describes with illustrations the construction and operation of specially designed equipment comprising a large oil-burning radiator (consisting of a series of 10-ft. steel pipes) from which the circulating air absorbs the available heat units.

981. GEĬ, N. N. Suška drevesiny infrakrasnymi lučami. **[Seasoning of wood with the aid of infra-red radiation.]** *Sbornik UkrNIIMOD, Kiev* 2, 1952 (101–21). [Russ.?] From *abstr.* in *Prehl. lesn. Lit.* 6 (2), 1955 (No. 603). [Slovak.] P.R.

According to results of tests, thin material (for packing, skirting, etc.) can be seasoned by this method in ca. $\frac{1}{10}$ of the time required by conventional drying. Belt-conveyor transport during seasoning can be introduced.

982. GEĬ, N. N. Suška drevesiny električeskim tokom zvukovoj častoty. **[Seasoning of wood with the aid of sonic-frequency electric current.]** *Sbornik UkrNIIMOD, Kiev* 1950 (85–103). [Russ.?] From *abstr.* in *Prehl. lesn. Lit.* 6 (1), 1955 (No. 178). [Slovak.] P.R.

Presents results of seasoning Oak, Pine, Birch and Alder by means of a 50–500 cycles/sec. current, using an apparatus that is described and illustrated. The effect of wood defects on drying is discussed, and seasoning schedules are given.

983. TERAZAWA, S., and IWASHITA, M. **High frequency drying of wood.** *Transl. For. Prod. Lab., Can.* No. 87, 1955. pp. 10. 17 refs. Transl. from *Bull. For. Exp. Sta., Meguro, Tokyo* No. 68, 1954 (229–43). [See *For. Abstr.* 16 (No. 3544).] Limited distribution. P.R.

848. Timberyard Practice. Handling and Storage of Timber

See also Nos. 757–8, 892, 948.

984. PECK, E. C. **Storage and handling of lumber (at wholesale and retail yards and consumer plants).** *Rep. U.S. For. Prod. Lab., Madison* No. 1919, 1955. pp. 20 + 16 photos + 2 dgms. + 1 gph. + 2 tbls. 3 refs. P.R.

Recommendations based on experimental work and field experiences of the Madison staff.

985. BLOEMER, A. Studien und Wirtschaftlichkeitsbetrachtungen über Stapelvorrichtungen. **[Investigations and economic considerations of stacking appliances.]** *Holz-Zbl.* 81 (93), 1955 (1111–2). [G.]

An illustrated description of different methods of stacking sawn timber, used in Sweden. Two tools that aid stacking by hand are described; appliances also described are band and chain elevators, slewable cranes and lift-fork trucks. The costs of stacking by hand, by elevators, and by lift-fork trucks are graphed, and the respective efficiencies (in hours/cu.m./man) tabulated for Spruce boards 24 × 120 and scantlings 80 × 120 mm.

986. Transport av bakhon—bunting. **[Transport of slabs: bundling.]** *Inform. Skogbr. Skogind. ForsknForen.* (*Transportutv.*) No. 41, 1955. pp. 4 + 2. [Nor.e.]

Discusses the advantages of bundles for transport and storage, suitable lengths and bundle sizes, and equipment needed.

85. Grading of Wood and Wood Products

851. Timber Quality in General

987. KOLTZENBURG, C. Untersuchung einer auf einem Laubholzstandort erwachsenen Wertholzkiefer. **[Research on a high-quality Pine [log] from a broadleaved-forest site.]** *Arch. Forstw.* 3 (5/6), 1954 (503–17). 13 refs. [G.g.]

A detailed consideration of the course of growth as affecting timber quality in the 9-m. butt log of a 170-year Scots Pine grown in a broadleaved stand. The examination shows that under special conditions (heavy shade in youth) high-quality Pine can be grown, contrary to common opinion, on good sites. Quality was expressed in this butt log by fine knots in the core, subsequent rapid diameter growth and freedom from branchiness and swellings; at least 50–70% of the sawn out-turn of such logs falls into the 1st grade. Pine on better sites requires close planting and the maintenance of a dense stand in youth for self-pruning. Graphs include ring width in early and late wood through 165 years, height growth of the first 30 years (leader 3 times destroyed), mean knot length, depth of occlusion region (*Überwallungstiefe*) and branch diameter at each metre of log length, the distribution of length and diameter and proportion of rot in knots by classes, and variation of branch angle along the log. Recovery is illustrated in diagrams and with reference to grades as affected chiefly by knots.

852. Detection, Recognition and Assessment of Injuries and Defects

See also Nos. 505, 507–8, 893, 903.

988. KOUKAL, M. Co je příčinou zapaření bukové kulatiny? **[What is the cause of incipient deterioration of Beech roundwood?]** *Les, Bratislava* 2 (7), 1955 (301–4). 10 refs. [Cz.]

Discusses the existing theories of the primary cause of incipient deterioration (incipient decay, dote, '*Erstickung*', '*Verstockung*') of Beech wood. In the author's own experiments, Beech logs were end-coated, directly after felling and cross-cutting, with a fungicidal paste (60% 'Fluoran' [not specified] and 40% water, or 50% 'Fluoran', 30% water and 20% coal-tar oil), which was also applied to all injured places on the log. After 2–3½ months, a cone-shaped, brown discoloration of the sapwood developed from the end faces to a depth of 10–40 cm.; control logs were attacked by white rot. Tylose formation was observed in most logs, while fungal hyphae were very rare in the treated logs. The deterioration peculiar to Beech wood should, the author believes, be divided into two processes: (1) incipient deterioration (brown discoloration, the 'variegation' of Paclt (unpublished), '*Erstickung*') which is characterized by change of colour and formation of tyloses, necrosis of the tyloses causing the discoloration; (2) fungal infection (dote, '*Verstockung*') which, in turn, can be divided into (*a*) infection with fungi subsisting on the cell contents, and (*b*) infection with true wood-destroying fungi. The use of fungicides can only counteract (2), without preventing the primary process of discoloration, which can be prevented (or reduced) by (i) early killing of the parenchymatous cells (e.g. by steaming), (ii) rapid drying, and (iii) exclusion of air.

989. LARSEN, C. M. Compte rendu d'une étude sur le bois pelucheux du peuplier belge en considération de son rôle dans l'industrie allumettière. [**A study of 'woolliness' of Belgian Poplar in relation to its use as match stock.**] *Spec. Pap. 8th Sess. int. Poplar Comm., Madrid 1955*, No. *FAO/CIP* 75 *D Add.* 1, 1955 (101–14). [F.] [Institut de Populiculture de l'Union Allumettière, Grammont.]

'Woolliness' is a common defect in Poplar veneers cut for match stock. A detailed study was made, of several trees each, of the Poplars chiefly grown for this purpose in Belgium (× *P. robusta*, × *P. marilandica*, × *P. serotina*, × *P. regenerata*, and other hybrids), to determine what factor or factors caused this defect. No statistically significant differences in its occurrence were observed in relation to differences in species etc., provenance, topography, or soil, and no marked influence from lean or from the form of plantation (single rows, narrow belts, forest stands). The greatest % of 'woolly' wood occurred in butt logs, decreasing upwards in the stem and almost disappearing at a height of 18 m. It is concentrated in the centre of the tree, and most of the unaffected wood is found in the 10 outer growth rings. It is estimated that in an average tree, 18 m. high, the upper log (9–18 m.) would produce 89% good veneer and 2·7% with slight and 8·3% with severe 'woolliness'. The best wood is found in the logs from 9 m. upwards. This quality of 'woolliness' does not correspond directly with the definitions of gelatinous or tension wood, with which it is often confounded. Studies to date do not enable its cause to be stated or external signs for its recognition to be laid down.

990. PEACE, T. R. **Black heartwood.** [*Pap.*] *8th Sess. int. Poplar Comm., Madrid 1955*, No. *FAO/CIP/78-B*, 1955. pp. 2. [E.]

Reports on a preliminary inquiry on the occurrence of black heartwood in Poplar grown in Britain. There appears to be evidence that trees grown on low, wet sites are particularly subject to this defect. On the other hand, trees grown in Herefordshire and Shropshire, on Old Red Sandstone, produce particularly pale heartwood. × *P. regenerata* is said to be particularly subject to dark heart.

991. **Black heartwood: report of the National Poplar Commission of the Netherlands.** [*Pap.*] *8th Sess. int. Poplar Comm., Madrid 1955, FAO/CIP/78-A*, 1955. pp. 2. [E.]

This defect is found mainly in Poplars grown on excessively wet sites, e.g. with stagnant groundwater. Heartwood of × *Populus gelrica* and *P. deltoides* subsp. *missouriensis* is generally lighter in colour than that of × *P. marilandica*, × *P. serotina* and especially × *P. robusta*. For the most part the defect does not cause serious loss in industry.

853. Grading of Wood in the Rough

See also No. 773.

992. FLICK, F. J. **Grading logs and trees for quality: a bibliography compiled for the Log Grade Committee, Forest Service.** U.S. Forest Service, Washington, D.C. 1955. pp. 27.

Gives 245 references, all dealing with N. America, and arranged by regions.

854. Grading of Converted Timber

See also No. 773.

993. WHITMORE, R. A., and THORNTON, P. L. **Lumber-value meter for central hardwood sawlogs.** *Sta. Note Cent. St. For. Exp. Sta.* No. 89, 1955. pp. 2 + 2 dgms. 2 refs.

A circular card meter of the slide-rule type is appended; it allows for log grading by the Madison Forest Products Laboratory grading system, and for the determination of the quality index [cf. *For. Abstr.* 15 (No. 4306)] for different grades and species by log diameters.

994. **Stress grades and working stresses.** *Rep. U.S. For. Prod. Lab., Madison* No. 1903–14, 1953. pp. 22 + 6 dgms. + 1 gph. + 7 tbls. P.R.

Discusses the factors affecting stress grades and working stresses and shows how they are applied in the grading and use of structural lumber.

86. Pulp Industries. Composite Materials made Wholly or Partly of Woody Matter. Chemical Utilization of Wood

861. Pulp and Paper Manufacture. Textile and Other Cellulose Derivatives

See also Nos. 281, 729, 761, 778, 841.

995. SHIUE, C. J., HUNG, C. M., and SHEU, J. F. [**Studies on the pulping of wood in Taiwan.**] *Bull.*

Taiwan For. Res. Inst. No. 19, 1950. pp. 18 + 4 tbls. 12 refs. [Chin.e.]

Reports on 10 economic species, viz. *Pinus armandi*, *Tsuga chinensis*, *Cunninghamia lanceolata* (introduced from Fukien), *Cryptomeria japonica*, (introduced from Japan), *Taiwania cryptomerioides Libocedrus formosana*, *Trochodendron aralioides*, *Liquidambar formosana*, *Aleurites montana*, and *Schima superba*. Full data on the location, dimensions, and age of the material are followed by morphological analyses of the fibres, with photomicrographs, by chemical analyses, and by detailed results of sulphite, soda and sulphate pulping. Tables and photos have English legends. Factual summaries are given for all species, including some indications of economic availability and the best pulping treatments.

996. DU, H.-T., and HUNG, C.-M. **[Studies on the pulping of wood in Taiwan (2). Studies on the material collected from Lien-Tan-San.]** *Bull. Taiwan For. Res. Inst.* No. 37, 1952. pp. 14 + 4 tbls. 7 refs. [Chin.e.]

Reports on a further 10 species: *Abies kawakamii*, *Picea morrisonicola*, *Chamaecyparis formosensis*, *C. taiwanensis*, *Actinodaphne nantoensis*, *Machilus arisanensis*, *Daphniphyllum oldhami*, *Alnus formosana*, *Acer oliverianum* and *Schefflera taiwaniana*.

997. L'utilisation des ressources en cellulose des forêts d'Afrique Équatoriale Française.] **[Exploitation of the cellulose resources of French Equatorial Africa.]** *Rev. int. Prod. colon.* 30 (310/311), 1955 (158–62). [F.]

Reviews the research projects in progress on pulpwood resources, pulping qualities of different species, and management of forests for pulpwood production.

998. **Pulping of New Guinea woods.** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1953/54*, 1954 (89–90).

Pulps produced from *Araucaria* spp. in yields of 54–59% by the sulphite process, had strength properties much lower than for the corresponding sulphate pulps. The sulphite pulps had low pentosan contents and this, together with the high yields, indicated that they might have possibilities for conversion to a dissolving-grade pulp. Representative samples of *Eucalyptus deglupta* and *Rhizophora apiculata* pulped readily by the sulphate process, giving yields of 50%. The former species gave a pulp only slightly inferior in strength properties to commercial Eucalypt kraft pulps; the latter species compared favourably in tearing strength, but was lower in all other strength properties. Mixtures of woods of the Mangrove association have been pulped successfully by the sulphate process. Preliminary investigations indicate that some of the light-coloured, low-density woods may be used for the production of mechanical pulp. Of these, *Camptostemon schultzii* and *Excoecaria* spp. are the most promising.

999. ALFTHAN, G. VON. **Running control in groundwood mills by means of recording wood meters.** *Svensk PappTidn.* 58 (14), 1955 (503–12). [E.e.] P.R.

Describes, with illustrations, electrically controlled recording equipment developed at the Oy Keskusalaboratorio, Helsinki, and used successfully for recording wood consumption by the grinders.

1000. LINDBERG, N. J., and MACLAURIN, D. J. **Orienting studies concerning strength properties of Southern Pine groundwood.** *Pap. ja Puu* 37 (8), 1955 (409–16). 4 refs. [E.e.sw.] P.R.

Discusses the effects of various treatments, and differences between groundwood pulps of different fibre-length fractions as compared with mixed softwoods of the northern U.S.A.

1001. **The mechanism of delignification.** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1953/54*, 1954 (89).

A detailed study of the effect of chip shape on the delignification of *Eucalyptus regnans* wood by NaOH and Na_2S, showed that the rate of delignification is greater in the longitudinal than in the radial direction and least in the tangential direction. This effect is more definite with Na_2S than with NaOH cooking. Pentosan removal appears to be independent of chip shape.

1002. NYLINDER, P., HÄGGLUND, E., *et al.* Ståndorts- och trädegenskapers inverkan på utbyte och kvalitet vid framställning av sulfitmassa av gran. **[Effect of site and tree properties on yield and quality of Norway Spruce sulphite pulp.]** *Medd. Skogsforskn-Inst., Stockh.* 44 (11), 1954. pp. 184. 4 pp. of refs. [Sw.sw.e.] Price *Kr.*10.

Samples were taken at different heights on the stem from trees on 171 plots in different parts of Sweden, in untouched stands of pure Spruce, representing most of the common soil and vegetation types. Factors studied included: soil; climate (temperature, humidity, wind); annual-ring width and late-wood %; b.a. and number of trees/ha.; form factor; taper; and branchiness. Particulars are given of the relation of different site and tree factors to the knot content and properties of knotwood, heartwood content, oven-dry density (o.d.d.), fibre dimensions and chemical composition of the wood. Cellulose yield decreased with increasing latitude and altitude, with increasing height in stem and lignin content, and increased with increasing late-wood content. Tearing strength of the pulp decreased with increasing latitude, height in stem, and annual-ring width, and increased with increasing o.d.d. Tensile and bursting strengths increased with higher latitudes and decreased with increasing height in the stem, o.d.d. and late-wood content. A slight positive relation was found between heartwood content and Roe number. The sugar content of the pulp was inversely related to Roe number, latitude, o.d.d. and height in stem. No relationship was found in a preliminary investigation between soil charactistics and wood or pulp properties; nor between branch form (e.g. as in 'comb' Spruce) and wood and pulp properties after the elimination of the influence of climatic and other factors. Results are given in 110 tables and 38 graphs, with English legends.

862. Composite Materials made Wholly or Partly of Woody Matter

See also No. 877.

1003. KEYLWERTH, R. Untersuchungen über die Gleichmässigkeit von Spanplatten und Faserplatten. **[Investigations on uniformity in chipboards and fibreboards.]** *Holz Roh- u. Werkstoff* 13 (6), 1955 (216–21). 1 ref. [G.g.] P.R.

Describes the application of statistical methods to investigations on the uniformity of density and board thickness of chipboards (2 kinds) and fibreboards (1 kind).

1004. BISCHOFF, W., and HUBER, W. Die Messung der Dickenquellung und Wasseraufnahme von Spanplatten. **[Measuring water absorption and swelling of chipboards.]** *Holz.-Zbl.* 81 (102), 1955 (1211–2). [G.]

Describes experiments showing that both swelling at test points and water absorption differ greatly for boards submerged horizontally and vertically (both methods being permissible under German testing rules). Not only is swelling at the lower ends of the latter greater than at the upper ends, but the total swelling and water absorption are 5–10 times greater after a 24-hour test period. The difference is attributed to the pressure gradient existing along the surface of vertical boards which facilitates the escape of air. The authors describe a third testing method, developed by Messrs. E. Behr, Wendlingen, in which specimens of smaller size, only partly standing in water, are measured and weighed after ½, 1, 2, 3, 5 and 24 hours, the first 5 hours being, according to the authors, the most important for practical purposes. Comparative test results according to the three methods are tabulated for both swelling and water absorption.

1005. COOKE, W. H., and FRASHOUR, R. G. **Resin application in attrition-mill type particle board.** *For. Prod. J.* 5 (4), 1955 (214–8).

Report on research at the Oregon Forest Products Laboratory. It was found that an increase of phenolic-resin content from 4 to 6% improved board properties. Powdered resin gave greater resistance to water absorption, but for all other properties liquid resin was better. Water absorption, and thickness swelling at centre and edge showed significant correlation. Tests showed that green-ground material produced boards with a higher modulus of rupture and resistance to water absorption, whereas boards made from dry-ground material had greater dimensional stability.

1006. **The Curvi-Board process for manufacturing core stock.** *For. Prod. J.* 5 (4), 1955 (24*A*–25*A*).

The engineers at A.B. Defibrator, Stockholm, have developed a batch process utilizing green or dry chips. A combination of H.F. and hot-plate press is used for curing the 'mat', to which face veneers are applied during manufacture.

1007. CONNELLY, T. J. **The Kreibaum process for extruded core board.** *For. Prod. J.* 5 (4), 1955 (21*A*–23*A*).

Discusses the history and operation of a vertical extrusion process for manufacturing chipboard core stock.

1008. **Automatic plant for chipboard.** *Timb. Tr. J.* 214 (4124), 1955 (86–8).

Describes the new factory at Annan of the Airscrew Company and Jicwood Ltd., producing 10,000 tons/year of finished chipboard (Wayroc) from locally grown conifer thinnings. The new plant is completely automatic. The modulus of rupture of the boards at 3 densities is compared with whole wood of Scots Pine, Douglas Fir and Beech. [Cf. *For. Abstr.* 16 (p. 304).]

1009. STEGMANN, G. **The development and production of wood waste boards.** *Transl. Commonw. sci. Industr. Res. Organ. Aust.* No. 2406, 1955. pp. 9. Transl. by E. Feigl from *Holz-Zbl.* 80 (23), 1954 (297–8). [See *For. Abstr.* 15 (No. 3054).] Limited distribution. P.R.

1010. RUSO, R. Suomalaisista rakennuslevyistä. **[Finnish building boards.]** *Tied. Valt. tekn. Tutkimusl.* No. 133, 1954. pp. 18. ([Fi.e.] P.R.

Discusses the different types of fibreboard made in Finland, the use and properties of plywood and blockboard using Birch veneers, corrugated cardboard, millboard-covered gypsum board (Gipsonit), wood-wool slabs using Portland cement as a binder, asbestos-cement products (often incorporating wood fibres) and mineral-wool slabs. Gives tables showing technical properties of Finnish wood fibreboards, wallboard manufacturers and their products, and strength properties and density of Finnish Birch plywood. *From author's summary.*

1011. KARAHASANOVIĆ, A. Anatomski sastav drveta i proizvodnja ploča vlaknatica. **[Anatomical structure of wood and the manufacture of fibreboards.]** *Šumarstvo* 8 (1/2), 1955 (33–41). 11 refs. [Serb. serb.e.g.]

The tracheids in coniferous wood are not only longer and thinner-walled than in broadleaved species, but also interweave and bond better, thus being more suitable for the manufacture of fibreboards. The mutual adhesion of fibres depends to a large extent on suitable processes of fiberization.

1012. WACEK, A., and MERALLA, S. **Fibre felting and bonding.** *Transl. Fac. For. Univ. B.C.* No. 13, 1955. pp. 10. 15 refs. Transl. by F. von Althen from *Holzforschung, Berlin* 6 (3), 1952 (65–70). [See *For. Abstr.* 15 (No. 931).]

1013. BASLER, H. **Causes and action of the binding force inherent in fibrous materials as they affect hardboard manufacture.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 2416, 1955. pp. 16. 26 refs. Transl. by E. Feigl from *Holz Roh- u. Werkstoff* 11 (8), 1953 (297–302). [See *For. Abstr.* 15 (No. 2057).] Limited distribution. P.R.

1014. SKARK, L. **Moistening and elongation of flat fibrous structures, especially fibreboards.** *Transl. Fac. For. Univ. B.C.* No. 10, 1954. pp. 6. 6 refs. Transl. by D. Mueller-Dombois from *Papier, Darmstadt* 3 (5/6), 1949 (82–6).

1015. FÁY, M. A farostlemezgyártás fejlödése. **[The development of fibreboard production.]** *Erdö* 3 (9), 1954 (324–30). [Hu.]

Data are reported [source not stated] on European production (1948–1953), increase in world production (1925–1953) and manufacturing capacities, including German standards according to type of board (insulating, semi-hard, hard, extra-hard) and Hungarian standards according to type of fibre (Poplar, Beech, hemp, flax, various mixtures of peat and Poplar, with and without addition of 2% synthetic resin). Possible uses and the potentialities for expanding production in Hungary are briefly discussed.

1016. PEEL, J. D. **Suitability of a mixture of Malayan woods for hardboard manufacture.** *Malay. Forester* 8 (3), 1955 (157–9). [Forest Research Institute, Kepong.]

Experiments were made with typical sawmill waste of 60% Meranti (*Shorea* spp.), 20% Keruing (*Dipterocarpus* spp.), 10% Kempas (*Koompassia malaccensis*), 8% Balau (*Shorea laevis*), and 2% Geronggang (*Cratoxylon arborescens*). The wood was chipped by hand (including bark), soaked for 9 min. at 50° C., and defibrated in an Asplund Defibrator. The resulting pulp was refined, sized with 1% paraffin wax, and pressed into boards of 4 mm. nominal thickness and 0·95 sp. gr. Pressure was at 50 kg./sq. cm. and 200°C. Properties of the boards for different drainage times and heat treatments are tabulated. It is concluded that the mixture of woods tested is suitable for the manufacture of hardboard of excellent quality and appearance, boards with properties considerably better than the minimum British Standard Specifications being produced without difficulty. The yield is as high as that from softwoods.

1017. **Production of fibreboard from secondary colonial timbers.** *Rep. For. Prod. Res. Bd., Lond. 1954*, 1955 (41–4).

Satisfactory hardboards were made on a laboratory scale from 4 Malayan timbers, Kempas (*Koompassia malaccensis*), Red Meranti (*Shorea* spp.), Keruing (*Dipterocarpus* spp.) and Balau (*Shorea* spp.). A mixture of chips in the proportion 64% Meranti, 24% Keruing, 6% Kempas and 6% Balau, roughly the proportion present in sawmill waste in Malaya, gave boards of good appearance and properties, retaining the best characteristics of those from the individual species. Particulars of the method of manufacture used, properties, and treatment needed to produce standard and super hardboards are given. Boards from heartwood and sapwood of *Juniperus procera* had adequate strength and those from the heartwood adequate water resistance for standard hardboards. The higher water absorption of the sapwood boards could be reduced to standard- and super-hardboard level by heat tempering and oil treatment respectively. Boards of unextracted and ether-extracted heartwood suffered no loss of weight when exposed to attack by 4 wood-destroying fungi for 3 months; boards from sapwood and alcohol-extracted heartwood lost up to 25% of their initial weight. Similar results were obtained from exposure to attack by *Coptotermes lacteus*.

1018. FARMER, R. H., and PACKMAN, D. F. **The production of hardboard from tropical timbers. II. Red Meranti (*Shorea leprosula*), Keruing (*Dipterocarpus crinitus*), and Balau (*Shorea laevis*).** *Colon. Plant Anim. Prod.* 5 (1), 1955 (39–50 + 1 plate). 5 refs.

Super hardboard according to the requirements of British Standard 1142 (1953) (*Fibre Building Boards*) was made in good yield from each of the species tested by means of a modified neutral sulphite semi-chemical process. Chips cooked for 30 minutes with 3·5% Na_2SO_3 were defibred and refined in a disc mill and the resulting pulps hot-pressed into boards which were then tempered by heat treatment alone, without any addition of size, oil, etc.

While the boards made from Meranti and Keruing proved satisfactory in all respects, those from Balau tended to be uneven in colour. Balau also presented other difficulties in the defibration stage of the process and proved to be the least amenable of the Malayan species so far tested for board-making.

Treatment of mixed batches of chips containing Kempas, Meranti, Keruing and Dalau yielded pulp from which boards of uniformly good properties and appearance were pressed. In addition to the specified requirement for super hardboard, these were also found to have very good dimensional stability under conditions of changing humidity. *From authors' summary.*

1019. FRASHOUR, R. G., COOKE, W. H., and MORSCHAUSER, C. R. **Properties of dry-formed hardboards with various resin contents.** *Rep. Ore. For. Prod. Lab.* No. *L*-5, 1955. pp. 8 + [1] + 1 dgm. + 4 gphs. P.R.

Values for modulus of rupture, water absorption, specific gravity and moisture content of test specimens were compared to determine the effect of resin content and press temperature in dry-formed hardboard of steamed Douglas-Fir fibre with resin content 0–3%. Strength increased, and water absorption and toughness decreased with an increase in (1) resin content, (2) specific gravity or (3) press temperature.

1020. KUDRJAŠOV, N. Novyĭ termoizoljacionnyĭ material—Lignilitiz. **['Lignilitiz', a new thermal insulation board.]** *Holodiljnaja Technika, Moskva* 31 (4), 1954 (29–33). [Russ.] From *abstr.* in *Prehl. lesn. Lit.* 6 (5), 1955 (No. 1761). [Slovak.] P.R.

The boards are pressed from a mixture of technical hydrolysis lignin with vegetable fibres. Some of the properties are: density 0·2–0·25 g./c.c.; bending strength 4–8 kg./sq. cm.; water absorption 11–12% after 55 days' immersion.

1021. KUMAR, V. B. **Spontaneous ignition in the wood fibre insulation board stacks.** *Norsk Skogind.* 9 (5), 1955 (152–9). 9 refs. [E.e.nor.] P.R.

Reports on temperatures in normal and close stacks (with a free space of 12 mm. between groups of 4–6 boards or with no free space respectively) and on two methods of reducing stacking temperature.

863. Wood Hydrolysis. Saccharification

1022. WILEY, A. J., HARRIS, J. F., SAEMAN, J. F., and LOCKE, E. G. **Wood industries as a source of carbohydrates.** *Industr. Engng. Chem.* 47 (7), 1955 (1397–405). 59 refs. P.R.

Presents data on the quantity, location and nature of wood and pulping residues in the U.S. Discusses methods for processing such residues and the possibilities of further utilization. An interesting potential use for wood is its hydrolysis to produce furfural, CH_3COOH, levulinic acid and HCOOH.

867. Destructive Distillation

See also No. 887.

1023. CANTIANI, M. Ricerche sperimentali sulla carbonizzazione della legna di cerro e di faggio. **[Experiments in charcoal-making from the wood of *Quercus cerris* and *Fagus sylvatica*.]** *Ital. for. mont.* 10 (3), 1955 (125–9). [It.it.f.]

Experiments were carried out in the woods of Molise, using branchwood from the crowns of large trees. Yields are given in tables and graphs, as a function of weight of wood and duration of distillation, and also taking into account the amount of wood needed to heat the kilns. Maximum yields were obtained from kilns holding 125–150 quintals. Mean yield from *Q. cerris* was 20·04% and from *F. sylvatica* 17%.

89. Other ('Minor') Forest Products

892. Vegetable Products

See also section 28 and Nos. 277, 730.

892.4. Bark Products. Tanstuffs. Cork

See also Nos. 243, 265.

1024. **[Research on bark products.]** *Rep. For. Comm. N.S.W. 1952/1953*, 1954 (13).

It was found that treating the bark of *Pinus radiata* with 10% Na_2SO_3 prevented the deposition of insolubles from tannin extracts. The tannin contents of *Eucalyptus nubilis* and *E. crebra* barks were found to be too low for commercial extraction. Further work was done on the processing of *Melaleuca leucadendron* bark, and it appears that light-weight, fire-proofed insulation blocks can be made from the crude bark, which should be able to compete with commercial products made from slag wool. Studies of cork from the bark of *E. paniculata* have shown it to be very similar to *Quercus suber* cork.

1025. LINDSTEDT, G., and ZACHARIAS, B. **Chromatographic studies on Spruce bark tannin extracts.** *Acta chem. Scand.* 9 (5), 1955 (781–92). [E.e.] [University of Stockholm.] O.R.S.

Chromatographic studies on fresh bark extracts and a solid technical bark extract of *Picea abies* showed the presence of a large number of phenolic and fluorescent compounds, as well as some aldehydes or ketones. A few components occurred only in either the fresh or the technical extract.

1026. VARMA, B. S., and SHARMA, O. P. **The Wattle-bark—*Acacia mollissima* Willd., monthly variations of tannin contents.** *Indian For.* 81 (8), 1955 (496–7 + 1 gph.)

Examination of samples from 4-year-old Wattle plantations at Kohima showed that highest tannin contents occurred from December to March. Tan liquors were lightest in colour from October to April.

1027. FISCHER, G., GARDELL, S., and JORPES, E. **On the chemical nature of acerin and the virucidal and antiviral effects of some vegetable tannins.** *Experientia, Basle* 10 (8), 1954 (329–30). 6 refs. [E.g.] [Karolinska Institutet, Stockholm.] O.R.S.

Reviews earlier work on acerin [cf. *For. Abstr.* 14 (No. 2898)]. Eighteen natural tannins (including extracts from *Picea abies*, *Rhus coriaria*, *Quercus robur*, *Aesculus* sp., *Cassia* spp. and *Caesalpinia coriaria*) were tested. All had a considerable effect on the bacterial virus of *Escherichia coli*, killing it after 5 min. in concentrations of between 1/50,000 and 1/400. None had a bactericidal effect on the host cell after 5 min. and the majority none after 3 hours at a dilution of 1/100. A powerful virucidal effect similar to that of acerin was shown by tannins, e.g. Mimosa, ground Canaigre root, powdered Canaigre extract, Quebracho, Babul bark extract, and tannic acid.

1028. HARALAMB, A. Liberul de tei şi prelucrarea lui. **[Uses and harvesting of bark fibres from *Tilia* spp. in Rumania.]** *Rev. Pădurilor* 70 (2), 1955 (69–73). 2 refs. [Rum.]

1029. **Dihydroquercetin from Douglas Fir Bark.** *Rep. For. Prod. Res. Bd., Lond. 1954*, 1955 (34–40).

A small quantity of dihydroquercetin, a substance already isolated from the bark of American-grown Douglas Fir in yields of 4·0–9·8% [cf. *For. Abstr.* 14 (No. 3968)] has been prepared from much younger material grown in Great Britain.

892.5. Medicinal Plants, Edible Plants, Insecticides from Plants, etc.

See also No. 1027.

1030. HOCKING, G. M. [Compiler]. **A dictionary of terms in pharmacognosy and other divisions of economic botany.** Charles C. Thomas, Springfield, Illinois. 1955. pp. 284. Price 70*s*. I.F.B.

Definitions included in the body of the dictionary cover the following categories: specific and generic botanical and zoological names, with data on plant and animal species and their products; families—a brief description, with geographic range, and giving a few typical genera; Latin terms used in the U.S.A. and elsewhere and official terms used in English-speaking countries; native or common names of plants and drugs in several languages, those chiefly represented other than English being German, French, Spanish, Portuguese, Dutch and Italian; active plant principles and other phytochemicals; technical terms used in pharmacognosy proper; a limited number of botanical terms, of pharmaceutical preparations, minerals, terms used in agricultural and processing industries, commercial and trade terms, and biographical notes, and a large number of miscellaneous terms. Appendices include a 3-page bibliography, a list of important periodical and serial

publications in the field of pharmacognosy, a list of periodicals devoted to certain economic plants or plant products, and a list of terms describing properties and therapeutic uses of drugs.

1031. MAHDIHASSAN, S. **On *Capparis moonii*.** *Indian For.* 81 (9), 1955 (576–7 + 2 plates).

Identifies a drug used in treatment of leprosy as coming from the fruit of *C. moonii*, a shrub occurring in the coastal districts of Bombay.

1032. WILLAMAN, J. J., and SCHUBERT, B. G. **Alkaloid hunting: supplemental table of genera.** Agricultural Research Service, U.S. Department of Agriculture. No. *ARS*-73-1, 1955. pp. 18.

Supplements an article already published. [See *For. Abstr.* 16 (No. 4791).]

1033. FEUELL, A. J. **The genus *Rauwolfia*: some aspects of its botany, chemistry, and medicinal uses.** *Colon. Plant Anim. Prod.* 5 (1), 1955 (1–33). 238 refs.

A review of the literature, together with botanical descriptions and distribution of individual species.

1034. DUBOIS, L. ***Rauwolfia vomitoria* Afzel.** *Bull. agric. Congo belge* 46 (3), 1955 (567–95). 45 refs. [F.flem.]

The controlled price of the dried roots (source of reserpine) in the Belgian Congo is Fr.30,000/metric ton, and the value of the 1954 production F.14 million. The illustrated account includes a description with distinguishing characters of 8 other species, some of which are adulterants; method of collection and marketing; pharmacology; and native names. The plant coppices and can be propagated by cuttings.

1035. CROW, W. D., and MICHAEL, M. **The alkaloids of *Kopsia longiflora* Merrill. I. Isolation of the alkaloids.** *Aust. J. Chem.* 8 (1), 1955 (129–35). 1 ref. [C.S.I.R.O., Melbourne.] O.R.S.

The bark and leaves contained 4 new alkaloids: kopsinine in the bark, kopsiflorine in the leaves, and kopsilongine and kopsamine in both. The bark also contains β-amyrin and the leaves contain a mixture of paraffin hydrocarbons. The structure of the alkaloids is discussed.

1036. JANOT, M. M., and GOUTAREL, R. Alcaloïdes des *Voacanga*: voacamine et vobtusine. **[Alkaloids of *Voacanga* spp. [*V. africana* and *V. thouarsii* var. *obtusa*]: voacamine and vobtusine.]** *C.R. Acad. Sci., Paris* 240 (17), 1955 (1719–20). 4 refs. [F.f.] O.R.S.

1037. KARRER, P. **Curare alkaloids.** *Nature, Lond.* 176 (4476), 1955 (277–80). 17 refs. [Chemical Institute, University of Zurich.]

Analysis of the alkaloids from a number of *Strychnos* spp.

1038. GELL, R. J., HUGHES, G. K., and RITCHIE, E. **Alkaloids of *Evodia alata* F. Muell.** *Aust. J. Chem.* 8 (1), 1955 (114–20). 7 refs. [University of Sydney.] O.R.S.

The known alkaloids evoxanthine, melicopidine and kokusaginine were isolated from the bark, and evoxanthine and two new alkaloids, 2,3,4-trimethoxy-10-methylacridone, and evolatine from the leaves.

1039. BROWN, R. F. C. **The chemical constituents of Australian *Flindersia* species. VII. The synthesis of derivatives of kokusagininic and skimmianinic acids.** *Aust. J. Chem.* 8 (1), 1955 (121–4). 10 refs. [University of Sydney.] O.R.S.

Cf. *For. Abstr.* 16 (No. 3599).

1040. LAHEY, F. N., and WLUKA, D. J. **Geijerin: a new coumarin from the bark of *Geijera salicifolia* Schott.** *Aust. J. Chem.* 8 (1), 1955 (125–8). 3 refs. [University of Queensland.] O.R.S.

1041. CROMBIE, L. **Amides of vegetable origin. Part III. Structure and stereochemistry of *neo*-herculin [from *Zanthoxylum clava-herculis*.]** *J. chem. Soc.* March, 1955 (995–8). [Imperial College of Science and Technology, London.] O.R.S.

1042. HÖRHAMMER, L., HÄNSEL, R., and FRANK, P. Isolierung von Rutin aus *Betula humilis*. **[Isolation of rutin from *B. humilis*.]** *Archiv der Pharmazie, Weinheim* 286 (10), 1953 (481–2). 1 ref. [G.] O.R.S.

The leaves contained 1·4% of rutin.

1043. GEHRMANN, H. J., ENDRES, L., COBET, R., and FIEDLER, U. Über die Flavonglykoside der Rosskastanie. **[The flavone glycosides of *Aesculus hippocastanum*.]** *Naturwissenschaften* 42 (7), 1955 (181–2). 3 refs. [G.] [Universität München.] O.R.S.

1044. TÉTRY, A., SUTTON, E., and MOULLEC, J. Les phytoagglutinines du fruit et de la graine de *Sophora japonica* L. **[The phytoagglutinins of the fruit and seed of *S. japonica*.]** *C.R. Acad. Sci., Paris* 240 (25), 1955 (2434–6). 1 ref. [F.] O.R.S.

Cf. *For. Abstr.* 15 (No. 967).

1045. LAGRANGE, E. L'action bactéricide de l'extrait des feuilles de noyer, *Juglans regia*. **[The bactericidal action of an extract of leaves of *J. regia*.]** *C.R. Soc. Biol., Paris* 148 (23/24), 1954 (2097–8). [F.f.] O.R.S.

1046. PJATNICKIĬ, M. P., PJATNICKIĬ, N. P., and KRASILJNIKOV, D. I. **Non-bitter variety of the Himalyan Cedar as a source of vitamin C.** *Učenye Zapiski Krasnodarskogo Gosudarstvennogo Pedagogičeskogo Instituta* 1953 (11), (128–32). [Russ.] From *abstr.* in *Chem. Abstr.* 49 (11), 1955 (7813). P.R.

The needles contain 150–250 mg. of vitamin C per 100 g. of fresh matter. Describes method of preparing needle extract and conditions for the cultivation of the tree.

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar

See also No. 1092.

1047. HASKELL, H. **Colorado Pinyon, economic potentialities.** *Abstr.* in *Bull. ecol. Soc. Amer.* 36 (2), 1955 (52). A.P.B.

In parts of Hopi and Navajo Indian Reservations in N.E. Arizona, there exists a forest cover type consisting of a variable mixture of Pine and Juniper species. The principal Pine, *Pinus edulis*, yields building materials, 'nuts' and resin for local use. A survey has been undertaken to investigate the possible commercial value of the Pinyon Pine, which is abundant on the Reservations.

1048. ILOFF, P. M., JR., and MIROV, N. T. **Composition of gum turpentines of Pines. XXI. A report on *Pinus quadrifolia* from southern California, *P. lumholtzii* from Durango, Mexico and *Pinus caribaea* from Nicaragua. XXII. A report on *Pinus rudis* and *P. hartwegii* from Mexico and *P. insularis* from Philippines.** *J. Amer. pharm. Ass.* (*sci. Ed.*) 43 (12), 1954 (738–45). 20 refs. [California Forest and Range Experiment Station.] O.R.S.

1049. MIROV, N. T., and ILOFF, P. M., JR. **Composition of gum turpentines of Pines. XXIII. A report on three Mediterranean species; *Pinus pinea* (cultivated in California), *P. halepensis* (from Israel) and *P. brutia* (from Cyprus).** *J. Amer. pharm. Ass.* (*sci. Ed.*) 44 (3), 1955 (186–9). 11 refs. O.R.S.

1050. PENTEGOV, A. P., and PENTEGOVA, V. A. **[Resin acids from the oleoresin of the Siberian Cedar [*Pinus sibirica*].]** *Trudy Him.-Met. Inst., Akad. Nauk SSSR, Zapadno-Sibirskiĭ Filial* No. 7, 1953 (3–10). [Russ.] From *abstr.* in *Chem. Abstr.* 49 (13), 1955 (9291). P.R.

Two resin acids have been isolated from the solid, non-volatile portion of the oleoresin of *P. sibirica*: a crystalline acid similar to a low-melting abietic acid, and a non-crystalline acid, quite different from any other known resin acid.

1051. PENTEGOV, A. P., and PENTEGOVA, V. A. **[Resin acids in rosin obtained from the oleoresin of Siberian Cedar [*Pinus sibirica*].]** *Trudy Him.-Met. Inst., Akad. Nauk SSSR, Zapadno-Sibirskiĭ Filial* No. 7, 1953 (11–6). [Russ.] From *abstr.* in *Chem. Abstr.* 49 (13), 1955 (9291). P.R.

The rosin contains a non-crystalline resin acid and more neutral substances than that obtained from *Pinus sylvestris*.

1052. PENTEGOV, A. P., and PENTEGOVA, V. A. **[Balsam from Siberian Cedar [*Pinus sibirica*] for microtechniques and optico-mechanical industry.]** *Trudy Him.-Met. Inst., Akad. Nauk, SSSR, Zapadno-Sibirskiĭ Filial* No. 7, 1953 (17–25). [Russ.] From *abstr.* in *Chem. Abstr.* 49 (14), 1955 (9938). P.R.

Hard balsam obtained from the resin of *P. sibirica* can be successfully substituted for those currently used. Its properties are listed.

1053. PENTEGOV, A. P., and PENTEGOVA, V. A. **[Immersion oil from Siberian Cedar [*Pinus sibirica*].]** *Trudy Him.-Met. Inst., Akad. Nauk SSSR, Zapadno-Sibirskiĭ Filial* No. 7, 1953 (27–32). [Russ.] From *abstr.* in *Chem. Abstr.* 49 (14), 1955 (9938). P.R.

Immersion oil obtained from the resin of *P. sibirica* is quite suitable for use in microscopy. Its physical and physico-chemical properties are reported.

1054. BARDYŠEV, I. I. **O prisutstvii *n*-cymola v živičnom skipidare iz sosny obyknovennoĭ (*Pinus sylvestris*). [The presence of *n*-cymol in turpentine from Scots Pine resin.]** *Dokl. Akad. Nauk SSSR* 101 (2), 1955 (263–4). 7 refs. [Russ.] A.P.B.

Ca. 1% of *n*-cymol (*n*-methyl isopropyl benzol) was found in the turpentine. Physical properties are tabulated, with results of elementary analysis. The presence of this substance explains the high sp. gr. and refractive index and the somewhat unpleasant odour of samples of limonene isolated from the turpentine.

1055. PILLAI, M. S., and PILLAI, K. S. M. **Chemistry and utilization of Travancore forest products. IV. Chemical examination of the resin of *Sterculia urens*.** *Bulletin of the Central Research Institute, University of Travancore, Trivandrum* 3 (*A*), 1954 (133–7). From *abstr.* in *Chem. Abstr.* 49 (13), 1955 (9291). P.R.

The main constituent of the resin is a phlobatannin, $C_{15}H_{14}O_7$, containing 3 phenolic OH groups.

1056. NAIR, N. D., and VARIER, N. S. **Fixed oil from *Hydnocarpus wightianus*. I.** *Indian Soap Journal, Calcutta* 19, 1954 (225–7). 15 refs. L.S.

Oil was extracted with petroleum ether from seeds (38·5% yield) and its properties determined.

1057. KARIYONE, T., and ISOI, K. **Studies on plant waxes, VI. Lignans from the leaves of Coniferae (1).** *Journal of the Pharmaceutical Society of Japan, Tokyo* 74 (12), 1954 (1312–4). 7 refs. [Jap.e.] L.S.

Lignan in the wax from the dried leaves of *Chamaecyparis obtusa* and its variety *breviramea*, corresponds in its specific rotation and ultra-violet and infra-red absorption spectra to savinin obtained from *Juniperus* spp. and their identity is assumed. It is also stated to be identical with hibalactone from Nikko Cypress and from *Chamaecyparis obtusa* var. *breviramea*. *From authors' summary.*

1058. ASPINALL, G. O., HIRST, E. L., and WICKSTRØM, A. **Gum ghatti (Indian gum) [from *Anogeissus latifolia*]. The composition of the gum and the structure of two aldobiuronic acids derived from it.** *J. chem. Soc.* April, 1955 (1160–5). [University of Edinburgh.] O.R.S.

1059. CHARLSON, A. J., NUNN, J. R., and STEPHEN, A. M. **The composition of *Acacia cyanophylla* gum.** *J. chem. Soc.* Jan., 1955 (269–73). [University of Cape Town.] O.R.S.

1060. CHARLSON, A. J., NUNN, J. R., and STEPHEN, A. M. **[The composition of] *Acacia karroo* gum.** *J. chem. Soc.* May, 1955 (1428–31). [University of Cape Town.] O.R.S.

1061. BRINGI, N. V., SHAH, K. H., and VENKATARAMAN, K. **The colouring matters of *Garcinia morella*: Part I.** *J. sci. industr. Res., India* 14*B* (4), 1955 (135–52). 27 refs. D.S.I.R.

A study of morellin isolated from the seeds, and its various derivatives.

1062. KRIEBEL, H. B. **Comparative 'sweetness' of Black and Sugar Maples.** *For. Mimeo. Ohio agric. Exp. Sta.* No. 22, 1955. pp. 3.

A series of tests on 2 small adjacent stands of *A. nigrum* and *A. saccharum* showed no significant difference in the sugar contents of the sap of the two species.

892.7. Fruits. Seeds. Fibres, Yarns and Flosses

See Nos. 326, 1047, 1061.

893. Animal Products

1063. SMITH, F. G. **A course of twelve lectures on beekeeping.** *Beekeeping Division Pamphlet, Beekeeping Division, Forest Department, Tanganyika* No. 2, 1955. pp. 23. 6 refs. Price 1·50*s*.

A general course in note form, suitable for teachers and instructors, on the fundamentals for Tanganyika production, the estimated potential of which (5,000,000 colonies working in 228,000 square miles of woodland) is 5000 tons of wax and 60,000 tons of honey, valued respectively at £350 and £80/ton, a total of £6,550,000/year. The present population is ca. 700,000 colonies.

1064. SMITH, F. G. **Beeswax.** *Bee Division Pamphlet, Beekeeping Division, Forest Department, Tanganyika* No. 1, 1955. pp. 15. 1 ref. Price 2*s*.

Describes the bee-keeping regions; climatic considerations; the African honey-bee; beehives; collection, preparation, and marketing of beeswax; and fruit and field crops that require bee pollination. Tanganyika's annual export of beeswax, now ca. 650 tons (valued in 1951 at £364,000) is second only to that of the U.S.A. About $\frac{1}{6}$ is produced from the *Brachystegia* forest, and the most important tree is the very common *Pseudoberlinia* [*Isoberlinia*] *globiflora* which, with *P. paniculata*, flowers at the end of the rains (April–June) to produce the very high-quality honey and beeswax collected in July–August. The end of the dry season (Sept.–Nov.) sees a general flowering chiefly of the dominant *Brachystegia* spp., whereby the colonies are built up again, sometimes producing a surplus of comb.

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY

90. General

See also Nos. 743–4.

1065. BEGUÉ, L. Principaux aspects du problème forestier à Madagascar. [**The principal aspects of the forest problem in Madagascar.**] *Bois For. Trop.* No. 42, 1955 (3–13). [F.e.span.]

Outlines the problems (largely the result of pressure of population on land) and the measures being taken to meet them (survey of existing forests; planting useful species including Eucalypts and exotic Pines, to meet local needs; and protection of forests in catchment areas).

902. History of Forests and Forestry

See Nos. 727, 734, 741, 1098, 1101.

903. Forest Policy, General

See also Nos. 739, 1097, 1111.

1066. HESKE, F. **Forest policy with special reference to the countries of the Mediterranean Basin and the Near East region.** *Z. Weltforstwirt.* 17 (6), 1954 (197–215). [E.G.]

A lecture, delivered at the FAO Seminar on Forest Policy in Sept. 1954 at Istanbul, culminating in an 8-point programme calling first for the provision of workable alternatives to the present antiquated, wasteful methods of agriculture and land use as a pre-condition to an effective policy of conservation and afforestation.

1067. MARTÍNEZ HERMOSILLA, P. Los montes en la política agraria española. [**Forests in Spanish agrarian policy.**] *Bol. Inform. Minist. Agric., Madrid* 8 (52), 1955 (8–18). [Span.]

Reviews briefly agricultural policy in relation to forestry previous to 1936, lack of direction in the expansion of cultivated areas, high demands on land, low productivity, lack of financial support etc., and explains the situation since 1939 when a change in policy took place, giving information about the extent of the forests, present land use, forest conservation, improvement of public forests and afforestation.

1068. GONZALEZ VAZQUEZ, E. La política forestal dinámica y la selvicultura intensiva. [**A dynamic forest policy and intensive silviculture.**] The author, Madrid. 1954. pp. 48 + 12 plates. 88 refs. [Span.]

Discusses the fundamentals of a well directed rural economy and its relationship to an intensive silvicultural policy, presenting, as an illustration of the latter, some figures relating to production of a *Quercus ilex* stand managed chiefly for charcoal and mast. Notes are also presented on Spain's reforestation policy. A list of the author's publications is appended.

1069. **Forest policy in Pakistan.** [*Docum.*] *1st Sess. FAO Near East For. Comm., Teheran 1955*, No. *FAO/NEFC/13-C*, 1955. pp. 13.

1070. Rapport sur la politique forestière en Iran. [**Forest policy in Persia.**] [*Docum.*] *1st Sess. FAO Near East For. Comm., Teheran 1955*, No. *FAO/NEFC/13-A*, 1955. pp. 12. [F.]

1071. **Forest policy reports: Turkey.** [*Docum.*] *1st Sess. FAO Near East For. Comm., Teheran 1955*, No. *FAO/NEFC/13-D*, 1955. pp. 17.

1072. **Forest policy in Egypt.** [*Docum.*] *1st Sess. FAO Near East For. Comm., Teheran 1955*, No. *FAO/NEFC/13-B*, 1955. pp. 5.

1073. **Statement of forest policy in Northern Rhodesia.** *Rep. For. Dep. N. Rhod. 1955*, 1955 (29–32).

[Cf. *For. Abstr.* 16 (No. 1285).] Detailed under land protection, wood supplies, timber production, conservation of forest resources, financial return, research, education, extension work and land use, and discussed under principles, general directions for execution, first steps, finance and law. The statement was accepted by government on 25 March 1949, and laid on the table of the legislative council on the 30th of the same month.

1074. [Smythies, B. E.] **State of Brunei forestry development plan 1955–1964.** Government Printing Office, Kuching, Sarawak. 1955. pp. 35 + 2 maps. [E.malay.]

A report on forests and forestry in the state, with proposals for future policy, which have been officially adopted.

904. General Regional Accounts of Forests and Forestry

1075. Porter, E. Considérations sur la Scandinavie. [**Observations on [forestry in] Scandinavia.**] *C.R. 34e Assembl. ann. Ass. Ingén. for. Québec* 1954 (37–52). [F.]

Notes on a study tour, dealing mainly with the organization of state forest administration, commercial and professional forestry associations etc.

1076. Fogh, I. F. **Scandinavian forest operations. Some impressions of technique and development.** *C.R. 34e Assembl. ann. Ass. Ingén. for. Québec* 1954 (23–35). [E.]

1077. Smith, E. E. **Forest types and conditions in Cuba.** *J. For.* 53 (9), 1955 (655–8). 5 refs. (*Publication Journal Series, Atkins Garden and Research Laboratory of Harvard University, Cienfuegos, Cuba* No. 14.)

[Cf. *For. Abstr.* 16 (No. 1294).] A map shows the regions, a table classifies the types; also covered are land use (speculative extension of sugar cultivations), future supplies, rehabilitation of overworked forests, and future policy.

1078. Kaikini, N. S., and Bhathena, B. S. **Recent developments in Bombay forests.** *Indian For.* 81 (8), 1955 (452–5 + 3 photos).

A short account of the forests and the silvicultural problems involved in their management.

1079. **The forests in Indonesia.** *Rimba Indonesia, Bogor* 1955. pp. 96. [E.]

An illustrated account.

1080. Sarlin, P. Bois et forêts de la Nouvelle-Calédonie. [**Woods and forests of New Caledonia.**] *Publ. Centre tech. for. trop.* No. 6, 1954. pp. 303 + 131 plates + 3 maps. [F.]

Gives a short account of the climate, soils etc. of the islands, the principal vegetation types, and the current practices in silviculture and exploitation of the forests. The greater part of the book (220 pp.) consists of botanical descriptions with indications of distribution and wood properties of the forest species (for the most part illustrated by drawings).

1081. **Australia's oldest industry. Progressive increase of forest products output—more plantation grown softwood used for milling.** *Timb. Tr. J.* 214 (4118), 1955 (73–6).

A conspectus of Australian forestry, covering distribution and composition of forest types; acreage of commercial forest, including exotics; policy; research; and economic data for 1952–3.

905. Forest Statistics and Resources

See also Nos. 683, 729, 744, 1097–8, 1111.

1082. Ilvessalo, Y. Metsiemme metsänhoidollinen tila. [**The silvicultural condition of our forests.**] *Metsät. Aikak.* 1955 (5; 6/7), (139–42; 183–6). [Fi.e.]

The 3rd National Forest Survey, 1951–53, shows that in S. Finland 88% of the productive forests are worth further development, and 12% require replacing, usually by artificial regeneration. The corresponding figures for N. Finland are 82·2 and 17·8%. Felling the area that needs clearing in the near future will probably take 10–12 years in S., and 15–20 years in N. Finland. *From author's summary.*

1083. Ilvessalo, M. Suomen maa- ja metsäpinta-alan jakaantuminen omistajaryhmittäin. [**Finland's land and forest area by ownership groups.**] *Metsät. Aikak.* 1955 (5), (158–60). [Fi.e.]

Farms predominate throughout the country, especially in the south, both as regards total land and forest area; state ownership occurs primarily in the north; company, community and church forests in the south. *From author's summary.*

1084. Skogsstatistisk årsbok 1953. [**Statistical yearbook of forestry 1953.**] Kungl. Skogsstyrelsen, Stockholm 1955. pp. 172. [Sw.e.]

1085. [**Swiss forest statistics in 1953.**] *Schweiz. Forststatist.* 13 (4), [1955?]. pp. 38. [G.F.]

1086. **Wood and paper products: printing trades: operations in the woods: 1952.** Dominion Bureau of Statistics, Ottawa. 1954. pp. 248. [E.F.]

Brings together statistics on forestry and the wood-using operations from several of the Bureau's statistical publications.

1087. **Forest statistics for New York.** Northeastern Forest Experiment Station, Upper Darby, Pa. 1955. pp. 63.

1088. Bateman, W. **Forestry in the Northern Territory [of Australia].** *Leafl. For. Timb. Bur. Aust.* No. 72, 1955. pp. 16 + 7 photos.

A preliminary report on the forest resources of the territory and their potentialities.

907. Indirect Significance of Forests (Rural Amenity, National Parks, Forest Influences etc.)

See also section 116.

1089. **Symposium on the protection and conservation of nature in the Near East: Beyrouth 3–8 June, 1954.** UNESCO, Paris. [1955.] pp. 175. [E. or F.]

About half the papers are in English, and half in French. The following are more particularly of interest to foresters: The wood reserves of Egypt in the near past (*V. Tackholm*); Forest conservancy in the Near and Middle East (*H. Mooney*); The range of Lebanon Cedar (*M. Basbous*); The protection of the Cedars of Bcharré (*P. Guinier*).

1090. VOLKERT, E. Die Verbundenheit von Industrie und Forstwirtschaft auf wasserwirtschaftlichem Gebiet. [**The mutual interests of industry and forestry in water management.**] *Z. Weltforstwirt.* 17 (4), 1954 (122–30). 22 refs. [G.g.e.f.]

A general account of the influence of forests on water supply and the manner in which fertilizers can improve the water-retention capacity of certain forest soils. Industry, being interested in an abundant and stable water supply, should assist forestry by supplying suitable fertilizers and by providing a ready market for all kinds of wood, including thinnings, thus making intensive, scientific, and water-conserving forest management an economic possibility.

908. Relationship to Other Branches of Husbandry and Industry

See Nos. 1090, 1092.

91. Land Use, Land-Use Policy (Including Afforestation Policy)

See also Nos. 424–5, 1066–8, 1077, 1111.

1091. THALASSINOS, D. N. Apo tas aitias tēs katastrophēs tou hellēnikou dasous (1). [**Forest destruction in Greece and its causes (1).**] *Dasos* 7 (23/24), 1953 (41–46). [Gk.]

Outlines the historical development of common rights in the forest, with particular reference to firewood, and of laws and regulations to control them. The quantity of firewood cut and collected by local inhabitants for their domestic use without a licence being required, has been estimated at about 3,000,000 cu.m. annually; this is three times the quantity of wood (timber, firewood, charcoal) obtained by licensed traders. Up-to-date estimates are needed. An important abettor of forest destruction is goat-browsing, which perpetuates the damage done by unlicensed wood-cutting and fires (for which the herdsmen are sometimes responsible). Rich forests have been turned into 'woody pastures', whose extent has been estimated at 13,710,000 stremmas.

1092. SARGOS, R. Les landes de Gascogne et la culture du pin maritime. [**The Landes of Gascony and the cultivation of *Pinus pinaster*.**] The author, Aureilhan par Mimizan (Landes). 1954. pp. 312. [F.] Price *Fr.*1500.

Discusses in detail the problem of land use in the Landes, in terms of the competing interests of forestry (particularly resin-tapping), animal husbandry, agriculture and possibly (in the future) oil wells.

1093. PARRA ORTUM, J. L. Hacia una solución del problema de las roturaciones de los montes. [**The problem of ploughing forest soils for agricultural purposes.**] *Montes, Madrid* 11 (62), 1955 (141–3). [Span.]

Discusses problems caused by this practice in Spain, and the law in force, and suggests further measures for regulating and legalizing agricultural practices in the forests.

1094. DUTTA, R. N. **Settlement of tribes practising shifting cultivation in Madhya Pradesh (India).** *Indian For.* 81 (6), 1955 (370–5).

Information is given on work done under recent schemes, with progress made and expenditure incurred under different items. The official scheme for Raigarh Division is given as an appendix.

1095. TONDEUR, G. **Shifting cultivation in the Belgian Congo: extracts from a case study prepared in connection with a general FAO enquiry on shifting cultivation.** *Unasylva* 9 (2), 1955 (67–71).

General remarks on the causes and effects of shifting cultivation in this region.

92. Forest Ownership and Ownership Policy

See also Nos. 735, 1083.

1096. **Bibliography on land tenure.** FAO, Rome. 1955. pp. 386.

The bibliography, compiled by FAO in collaboration with the University of Wisconsin, has a short section of general and historical works, and the remainder is arranged under countries. Preface, notes, and contents are given in English, French, and Spanish.

1097. ABETZ, K. Bäuerliche Waldwirtschaft dargestellt an den Verhältnissen in Baden. [**Farm forestry as exemplified by conditions in Baden.**] Verlag Paul Parey, Hamburg and Berlin. 1955. pp. 348 + 33 plates. 206 refs. [G.g.] Price *DM* 38 [£3. 10*s.* 0*d.*]

In 1947, at the request of the Baden Forest Administration, the author took charge of a special survey to provide first-hand information on the small private forests (< 510 ha., but the overwhelming majority < 100 ha., in extent) of what is now South Baden. The present copiously illustrated work is based on that survey, for which the field work lasted until 1951, and on some supplementary investigations. It gives a comprehensive picture of these forests, which make up 132,951 ha. out of the total private forest area of 168,619 ha., and of their significance in the peasant farming economy of the region, where there is very wide variation in locality factors, ownership and legal conditions affecting it, size of holding, species and silvicultural practice etc. The matter is arranged under the following main heads: (1) Peasant economy and the forest (the regional background, and the significance of farm

forests in farm economy). (2) Methods used in the survey. (3) Ownership conditions, structure of farm forest ownership, and land law. (4) Site conditions. (5) Condition of the forests (silvicultural systems; species; forms of stand; site quality; age classes; stocking; increment; rotation; tending; regeneration). (6) Selection forests (Silver Fir, Norway Spruce and Beech, in combination or alone; Sweet Chestnut). (7) Coppice and coppice-with-standards (with special reference to measures for conversion to high forest). (8) Old '*Reutfelder*' (areas formerly periodically cut and burned over, used for temporary agriculture for 3–4 years, and then fallowed for 5–20 years, during which soft-wooded deciduous trees and shrubs would return, though the areas would generally be used more for cattle grazing than for producing wood) and rough pastures, with special reference to the need for further afforestation of such land. (9) Forest protection. (10) Types of silvicultural system and stand to be aimed at in future, with special reference to possibilities of mitigating the effects of fragmented ownership. (11) Yield, actual cut and production for sale (with sections on the possible sustained yield, consumption for farm purposes, and possible sustained production for the market). (12) Production of wood outside the forest (e.g. Poplar plantations). (13) Logging and utilization (including labour questions, working technique, utilization of wood and minor forest products, and improvement of accessibility for extraction of produce). (14) Business administration problems, especially book-keeping. (15) Pioneers of peasant forestry (with a list of exemplary peasant forest owners and brief notes on their holdings). (16) Forest policy problems (legal aspects); forms of co-operation (from owners' associations to common ownership); organization of advisory services; education; state subsidies etc.; tax problems; other policy matters). (17) An attempt to estimate the possible increase of yield by various measures, which is calculated as ca. 260,000 cu.m. (standing volume) or 1·8 cu.m./ha.; it is stressed that this figure can be reached if the general standard of management can be brought to that of the best-managed forests of the present day.

1098. MASCHER, R. Die Zusammenschlüsse im kleinen Waldbesitz Nordwestdeutschlands, ihre rechtliche und forstbetriebliche Gestaltung. [**Associations of small forest owners in north-west Germany, their legal structure and forms of forest management.**] *Schriften der wirtschaftswissenschaftlichen Gesellschaft zum Studium Niedersachens (n.s.)*, No. 55, 1954. pp. 235. 300 refs. [G.] (*Veröffentlichungen, Niedersächsisches Amt für Landesplanung und Statistik, Reihe A 1: Natur, Wirtschaft, Siedlung und Planung, Hannover.*)

A detailed account of the history and present extent of owners' associations of many types, from loose groupings to the historical joint ownerships of the so-called '*Hauberge*' in Siegerland. A form of voluntary or, where necessary, state-formed co-operative in which owners retain their individual holdings, pay the costs of any cultivation or other measures decided for these, and receive the proceeds from the sale of their own timber, while contributing jointly to administrative costs, is advocated as most suitable for most of the many different conditions and circumstances described. Joint management, involving an over-all plan wherever fragmentation is high (as in the southern parts where law and custom favour the division of individual holdings between heirs), but where the average size of holding exceeds 10 ha., with chief emphasis on reconciling neighbours' interests, the employment of a trained forester and, in many cases, of a labour force, are important features of such co-operation. This would stress the need for combined action for preserving and improving the 700,000 ha. of forest in holdings < 50 ha. (nearly 400,000 of which are in holdings < 10 ha.) rather than on joint marketing. Subjects discussed include the consolidation of scattered holdings, the suitability of selection working and the integration of agriculture and forestry on the farm.

93. Public Supervision and Regulation of Forestry, Including Legislation for these Purposes

See also Nos. 727, 734, 1097.

1099. GORDON, W. A. **The law of forestry.** H.M. Stationery Office, London. 1955. pp. viii + 574. Price £3. 10*s*.

The book, which is designed to cover the subject for the forester fully but without too many technicalities, deals with the law of forestry in Great Britain and the British colonies. Part I is an exposition of general principles (common law, equity and statute; former defects in English land law; land law reforms of 1925; legal estates; legal interests; equitable interests; criminal law; the law of torts; the law of contracts; Scots law). Part II, The law of forestry in Great Britain, is in 3 sections: (A) the old royal forests, (B) private woodlands, and (C) modern state forestry. (B) deals with questions of tenure, sale and purchase, mortgage, taxation, subsidies, nuisance, fire, game and vermin, theft, trespass and the Scottish law of woodlands, and statutes affecting forestry. (A) is largely historical, (C) deals largely with the Forestry Acts of 1945 and 1947. Part III, Forest law in the Colonies, has sections on English and colonial law, prevalent forms of land abuse, forest reservation, protection, form of colonial forest legislation. Part IV, Individual Colonies, has sections on Kenya, Tanganyika, Cyprus, Nigeria, Gold Coast, British Guiana, Fiji, and Northern Rhodesia. The law described is that in force up to the end of 1951.

1100. JOLLIFFE, W. H. **Trees on a farm: planning a woodlot.** *N.Z. J. Agric.* 90 (4), 1955 (409). A.P.B.

Gives notes on certain statutory restrictions on planting in New Zealand (Noxious Weeds Act, Fencing Act, Public Works Acts) dealing with overhanging trees etc.

94. Other Methods to Implement Forest Policy

944. Co-operation. Collaboration of Forest Owners

See Nos. 1097–8.

945.3. Education. Training

See also No. 1111.

1101. SCHENCK, C. A. **The Biltmore story: recollections of the beginning of forestry in the United States.** American Forest History Foundation, Minnesota Historical Society, St. Paul, Minn. 1955. pp. xv + 224 + 33 photos.

The author gives an account of his work in the U.S.A. from 1895 to 1913, as manager of G. W. Vanderbilt's forest in N. Carolina and founder of the Biltmore School for training foresters.

1102. BYERS, J. B. **An educational project in timber management.** *J. For.* 53 (9), 1955 (627–9).

Describes the use for the instruction of students in the West Virginia University of an 80-acre forest divided into 4-acre annual cutting areas, the object being to lead over from academic to professional work in the methods and costing of logging, the application of research, actual management, wildlife and utilization. Students traverse the coupe first as timber buyers, then as silviculturists; then purchase, fell, cross-cut and sell the timber themselves. Of the 10-week camp, 5 weeks are devoted to this course.

1103. **Forestry education: establishment of a regional forestry school.** [*Docum.*] *1st Sess. FAO Near East For. Comm. Teheran 1955*, No. *FAO/NEFC*/15, 1955. pp. 7.

Draft proposals for the establishment of a training school for forest rangers.

945.4. Research

See also Nos. 99, 177, 274, 759, 764–6, 997, 1111.

1104. Arbeitsbericht für den Zeitraum vom 1.4.1953 bis 31.3.1955. **[Report on work for the period 1.4.1953 to 31.3.1955.]** Bundesforschungsanstalt für Forst- und Holzwirtschaft, Reinbek bei Hamburg. 1955. pp. 63. [G.]

Organization and staff, with reports on the work of the 6 sections (Institutes), including lists of publications published directly at Reinbek or in journals etc.

1105. FERNANDES, C. TAVEIRA. Oito anos ao serviço do castanheiro. **[Eight years' work on Chestnut.]** *Publ. Serv. flor. aqüic. Portugal* 19 (1/2), 1952 (81–97 + 6 photos). 12 refs. [Port.]

Reviews work carried out over the period 1944–52 by a group of foresters, with the object of improving and developing Chestnut stands in Portugal, and presents a plan of future work.

1106. CORREIA, C. A. DE PAIXAO. Estudos sobre o sobreiro em Portugal. Trabalhos em curso na Estação de Experimentação Florestal do Sobreiro. **[Studies on Cork Oak in Portugal. Work in progress at the Cork Oak Forest Experiment Station.]** *Bol. Junta nac. Cortiça, Lisboa* 17 (200), 1955 (217–20, LXV–LXVII, 47–8). [Port.e.f.]

Presents short accounts of station projects and results achieved to date: (1) Vegetative propagation —success has been obtained in layering, using synthetic growth substances. (2) Behaviour of the root system in relation to the aerial parts of the plant during the first 2 years of the plant's life. (3) Possible relationship between weight of seed and plant development. (4) Nutrient requirements. (5) Protection of seed against depredations by animals. (6) Costs of different methods of artificial regeneration. (7) Producing Cork in coppice stands.

1107. **Near East forest research organization.** [*Docum.*] *1st Session FAO Near East For. Comm. Teheran 1955*, No. *FAO/NEFC*/14-8, 1955. pp. 9.

A note by the Secretariat, including a proposed plan for such an organization.

1108. KAUFERT, F. H., and CUMMINGS, W. H. **Forestry and related research in North America.** Society of American Foresters, Washington, D.C. 1955. pp. viii + 280. Price $5·00.

In three parts, dealing respectively with the U.S.A., Canada and Mexico. Reviews history, present organization, current projects, and future programmes, of research in forestry and forest products.

1109. **Sixth annual report on active forest research projects, year ended 31 March, 1955.** Forestry Research Division, Forestry Branch, Ottawa. 1955. pp. 142.

1110. **The Llancacura Forest Research and Training Centre: a co-operative project of FAO with the Government of Chile.** *Unasylva* 9 (2), 1955 (81–3).

Describes the Llancacura forest reserve (ca. 4600 ha.) the equipment and facilities of the centre, and the programme of research and training.

946.1. Associations, Societies

See Nos. 759, 1075

946.2. Conferences and Excursions

1111. **Report of proceedings of the 9th Australian Forestry Conference: Coff's Harbour, New South Wales, August–September, 1953.** Government Printing Office, Canberra. 1954. pp. 40.

Includes discussions and resolutions on: timber requirements, forest resources, forest policy, fire control, afforestation, research, tropical forestry, forestry education, utilization of wood waste, plantation costs, use and marketing of *Pinus radiata*, management of subtropical hardwood forest in N.S.W., management of hardwood forests in Victoria, management of indigenous conifers in Queensland, and classification of Tasmanian forests.

95. Forest Taxation

1112. **The agricultural landowner's handbook on taxation. Part 1.** Country Landowners' Association, 24 St. James's Street, London. 9th ed. (rev.) 1955. pp. 147. Price 15*s*.

Incorporates changes in income tax, death duties etc. in the U.K. up to the Finance Act, 1954. Part 1 deals with these and other subjects liable to frequent changes and will be revised and re-issued, as need arises, independently of Part II.

97. International Forest Policy and Other International Collaboration

971. Congresses, Conferences

See also No. 196.

1113. VIII Sesión de la Comisión Internacional del Chopo en España. **[Eighth Session of the International Poplar Commission in Spain.]** Ministerio de Agricultura, Patrimonio Forestal del Estado, Madrid. 1955. pp. 460 + 64 + 7 plates. [Span. F.E.]

Contains accounts in Spanish, French and English of excursions made in Spain in connexion with the 8th International Poplar Conference (with descriptions of some of the Spanish stands), and presents in both Spanish and French papers read by the Spanish delegates to the Conference (abstracted elsewhere in this issue of *For. Abstr.*).

FORESTRY THE WORLD OVER

References: 1. *American Nurseryman*, Chicago; 2. *Annual Report of the Botanic Gardens*, Singapore; 3. *Annual Report of the South Australia Forest Department*, Adelaide; 4. *British Columbia Lumberman*, Vancouver; 5. *Bulgaria Today*, London; 6. *Bulletin*, Bonn; 7. *Cellulosa e Carta*, Rome; 8. *C.S.I.R. Review*, Johannesburg; 9. *Dept. of Northern Affairs and Natural Resources Newsletter*, Ottawa; 10. *Holz als Roh- und Werkstoff*, Berlin; 11. *Holz Zentralblatt*, Stuttgart; 12. *Hungarian News*, London; 13. *India News*, London; 14. *Journal of Forestry*, Washington; 15. *Monthly Bulletin of the Iranian Forest Service*, Teheran; 16. *Nature*, London; 17. *Paperi ja Puu*, Helsinki; 18. *Scottish Agriculture*, Edinburgh; 19. *Southern Lumberman*, Nashville, Tenn.; 20. *Timber of Canada*, Toronto; 21. *Timber Trades Journal*, London; 22. *Times*, London; 23. *Unasylva*, Rome.

Argentina. Natural regeneration of Paranà Pine (*Araucaria angustifolia*) is difficult in Misiones Territory, because the ripe seed, when it falls in April and May, is eaten by wild and domestic animals, and also collected as food by the local inhabitants. Fire commonly kills off any young plants that succeed in establishing themselves. Several private companies have now embarked on making Paranà Pine plantations on a large scale, and the Government is providing credit facilities to planters through the National Bank. The system adopted is clear cutting followed by direct sowing (**23**; Sept. 1955).

Australia. What is believed to be an innovation in fire-weather forecasting, is a scheme to prepare simple hand-operated punched cards designed to locate analogues from past records with rapidity. Results have been encouraging, and the plan is to be put into practice by the S. Australian Woods and Forests Department (**3**; 1955).

The CSIRO is reported to have discovered in *Alstonia constricta* (Bitter Bark), a new source of supply of the drug reserpine, which is used in the treatment of high blood pressure and hypertension and is scarce throughout the world. Bitter Bark is found over a large area of N.E. Australia, and two firms are interested in producing the drug from it (**23**; Sept. 1955).

Brazil. A bill has been introduced in the Brazilian Chamber to reduce exports of Paranà Pine by 20% each year until 1960, when they will cease. The object is to limit production to the requirements of the home market since these forests would otherwise, according to an FAO report, be exhausted within 40 years. Further legislation will be introduced to stimulate replanting of cut-over Pine forest (**21**; 13.8.55).

Burma. Rafts containing 6000 tons of logs, floated down the Sittang River from Toungoo, arrived in September at Sittang, being the first to arrive since the insurgents seized 10 out of 36 rafts in 1945. A considerable saving in costs would be effected by reversion from rail to river transport (**21**; 5.11.55).

Bulgaria. Bulgaria now manufactures a composite board from wood and agricultural waste mixed with albumin glue of castor-oil-seed cake, compressed by a hot hydraulic press at 130° to 150° and a pressure of 1 to 50 kg./sq. cm. The material is claimed to be cheap, easily processed and polished, and suitable for furniture and acoustic panelling (**5**; Sept. 1955).

Canada. Mr. C. Makinson of the Terry Machinery Co. Ltd. in Montreal has designed a working model of a pipeline for transporting wood. Using Terry pumps and a venturi, he has moved pulpwood bolts through the pipeline at a rate of 16 m.p.h., and reckons that he can deliver 30 cords/hour at 128 bolts cord, over any distance. The cost of installing such a pipeline would be very high—$35,000/mile for 20-in. steel pipe and about the same amount for installation, for a maximum bolt diameter of 12 in.—which would limit the system to very short distances and very large volumes of wood (**20**; Nov. 1955).

A conduit 4544 ft. long and 12 ft. in diameter has been constructed of creosoted Douglas Fir staves 8–20 ft. long, 84 of which make up the girth of the pipe. One and a quarter million bd. ft. of timber have been used. Stave ends are butted into aluminium clips with an asphalt-mastic compound, and held in place by steel hoops, tightened as in ordinary cooperage (**4**; April 1955).

Investigations are in progress at the Ottawa Laboratory of the Forest Products Laboratories of Canada, on the possible use of high-temperature drying for Canadian timbers. Recent tests in a special kiln have shown that the range of final m.c. can be brought within acceptable limits, if a sufficiently high rate of air circulation (500 ft./min. and upwards) is used, together with a periodical reversal

of its direction. Canadian softwoods react well to drying at temperatures above 212° F., and there is little degrade. Drying times are only 1/5th of those in conventional kilns (**9**; October 1955).

The Pulp and Paper Research Institute of Canada is building the prototype of a reactor to test a new method for using the many millions of gallons of waste liquids that industry now has to throw away. Half of the solids in wood, at present, escape during the manufacture of sulphite pulp, and the new method is expected to stop this loss. It is believed that most of the reclaimed material will go back into the manufacture of newsprint. The reactor could probably be adapted for other manufacturing processes. One of the virtues of the process may be to mitigate the pollution of rivers by waste materials sent down the drain by industry. Furthermore, the large amounts of water now used by industry would be returned to source in a clean condition (**22**; 14.9.55).

Denmark. Junckers Trækemi is planning, as a result of pilot-plant experiments over 2 years, to use a proportion of Beech in coniferous pulps on a commercial scale. The Beech wood will be sawmill waste. The inclusion of Beech in the furnish should give a better surface for some grades of paper, have a favourable effect on drying, and allow more rapid passage through the machines (**17**; Sept. 1955).

East Africa. The Nuffield Foundation has given £21,900 for a 4-year scheme of research on the biology of tropical swamps, to be directed by Prof. L. C. Beadle, professor of biology in Makerere College. The area covered by swamps in East and Central Africa is enormous. In them are accumulating a large proportion of the plant nutrients washed in from the surrounding land, which are being preserved under anaerobic conditions. Exploitation by drainage and dry cultivation has begun, but this is not the only, nor, in the long run, necessarily the best method, since the organic matter is rapidly oxidized and the conditions under which it accumulates are destroyed. It is the purpose of this scheme to provide information on the chemistry and biology of swamps and of the changes that occur on drying, which may assist in framing a long-term policy (**16**; 17.9.55).

Germany. The Forest Research Station at Reinbek has initiated a large-scale investigation of the possibility of commercial growing of Eucalypts in Germany by planting out 2000 one-year seedlings from seed obtained in Argentina. It is intended to plant out, during the next few years, 2000 each of 11 Eucalypt species, in order to discover which are best suited to German conditions (**7**; Aug. 1955).

Two of the most destructive kinds of tropical termite are being bred and kept in underground laboratories at Rheinberg. They are kept in great cement basins half filled with soil, and surrounded by a system of steel doors and water conduits to prevent escape. The various rooms are equipped with automatic regulators by which the humidity of the air can be increased to 100% and its temperature to over 100° F. Research is done for the insecticide industry and also for those branches of industry that manufacture goods for the tropics and are concerned with making them termite-proof (**6**; 8.9.55).

'Mycological degradation' (decay) of wood is being applied in a pilot plant for the preparation of 'Mykoholz', wood softened by fungal decay, for use in the manufacture of pencils (**10**; May 1955).

Great Britain. The Hill Farming Research Organization, which became an independent, grant-aided research institute on 1.4.1954, includes in its research programme the relation between farming and forestry. At its farm on Loch Fyne in Argyllshire, about 1400 of the 4000 acres of hill land are to be planted, and the effect of this restriction of area on the numbers, weight, and performance of the ewe stock, and the eventual influence of the trees on herbage, run-off, and sheep stock will be studied (**18**; 1955).

Among new nature reserves established by the Nature Conservancy are Roudsea Wood near Grange-over-Sands, and North Fen near Windermere. Roudsea Wood is one of the most varied woodlands in the British Isles, with a rich flora and fauna and many different types of vegetation. The main part of the wood consists of two parallel ridges, one of limestone (crowned with a Yew wood and with Oak and Ash on its flanks) and the other of slate with typical slate Oak wood. On the seaward side it slopes down into the Morecambe Bay salt-marshes, and is one of the few places where the transition from salt marsh to woodland can be studied. North Fen is mainly woodland, just beginning to show signs of sphagnum-bog development (**16**; 8.10.55).

The Ministry of Transport and Civil Aviation has approved the use in British passenger vessels of the Danish laminated board 'Novopan' [cf. *For. Abstr.* 11 (p. 139)] for making structural, insulating, and fire-retardant partitions and divisions. The material is already used extensively in ships built in

many other countries. 'Novopan' B is a laminated board consisting of a core of synthetic-resin-bonded wood fibres and layers of asbestos, faced on each side with two cross-banded hardwood veneers (**21**; 22.10.55).

Hungary. Budapest is to plant a forest belt in a semicircle round its eastern and southern environs during the next few years, in order to intercept the dust clouds from the great plains. A total of 2400 acres is to be planted (**12**; 28.9.55).

India. The Government of Uttar Pradesh will undertake extensive plantation of Mulberry trees at district headquarters to increase silk production under the second Five Year Plan (**13**; 5.11.55).

Italy. A Mediterranean Populetum is to be established at the Agriculture and Forestry Experiment station of the Ente Nazionale per la Celullosa e per la Carta at Rome. All species, varieties and hybrids grown in the Mediterranean area will be planted. The aim will be to have plots of 20 specimens of each variety etc., at a uniform spacing of 5 × 5 m. (**7**; Aug. 1955).

New Zealand. A Timber Preservation Authority, to maintain a high standard of timber preservation in New Zealand, has been established under Government regulations. Important functions of the authority will be to encourage the proper use of indigenous and exotic timbers. The authority is expected to examine all preservative treatments for the purpose of determining their efficiency and to co-ordinate research into problems of preservation (**21**; 24.9.55).

Persia. The Forest Department has recently been raising *Liriodendron tulipifera* from seed in North Persia with a view to extending its introduction (**15**; July/Aug. 1955).

Plantation work has been started near Isfahan, with 14,000 plants of species considered suitable for the arid site chosen, e.g. *Ailanthus glandulosa*, *Fraxinus excelsior*, *Acacia* spp. and *Cercis siliquastrum* (**15**; May/June 1955).

It is proposed to appoint armed guards (ex-soldiers) to the Forest Service in order to enforce regulations regarding tree felling, charcoal burning, etc. (**15**; June/July 1955).

The Forest Department are setting up an experimental kiln at Dilband (E. of the Caspian), to test the performance of French and American charcoal kilns against the local-made type. Results will be published (**15**; April/May 1955).

Portugal. The Forest Service, established in 1901, has been governed since 1926 by a law promulgated in that year. This law has now been completely revised and the Forest Service Regulations amended and brought up to date. These include regulations for private holdings placed under the optional forest management scheme and 'simple supervision', which require first that the holding to be placed thereunder should be wholly or at least two-thirds forest land and that a working plan should be drawn up by a forest officer and approved by the Minister of Economy. Private holdings may also enjoy certain benefits even if they carry only scattered woodlots, windbreaks, hedgerow timber etc., provided that the total tree-bearing area amounts to one-third of the holding and that goat grazing is prohibited. Notices that an estate is under approved forest management must be posted at intervals along its boundaries (**23**; Sept. 1955).

Singapore. The Nature Reserves Ordinance of 1951 set up a number of nature reserves, amounting in all to 9000 acres, much of which had been Forest Reserve under the old Forest Ordinance. Bukit Timah, a Forest Reserve dating from 1883, is one of the few areas of good primary rain forest left on the island. It is just big enough to maintain its own internal climate and to be self-maintaining in regard to plant species. The other Nature Reserves contain areas of freshwater- and Mangrove-swamp forest, as well as secondary forest and scrub (**9**; 1955).

Sweden. The Boliden Mining Co. announces that a new method of wood impregnation recently developed at its laboratories has now been working satisfactorily for over 2 years with both Spruce and Pine. It is called the pressure-change method and was designed specially for conifer wood, in which the tracheids are connected by pit membrances acting as a kind of spherical valves for the transmission of the sap-stream. Since preservative liquids introduced lengthwise into the wood under constant pressure will block them and hamper the permeability of the wood, it is necessary to apply pressure and vacuum alternately, so that the passage is released for a moment, allowing a small quantity

of preservative to enter the valve spheres. Under normal conditions, the time required for full impregnation of wood does not exceed 20 hours, in which time ca. 800 vacuum-pressure periods are applied. A particular advantage of this method is the possibility of treating green, and even wet, Pine (**23**; Sept. 1955).

Union of S. Africa. The problem of providing an adequate and economically practicable fence for the Addo Elephants National Park has been solved by the ranger, Graham Armstrong. All forms of electric fence were unsuccessful, since the elephants soon discovered that they could root up the unelectrified standards. It was estimated that a rail and wire fence would cost £800 a mile. Armstrong, however, made an experimental half-mile of fence from disused tramway lines buried 6 ft. in the ground and connected with wire cables. One moonlight night he placed oranges, a favourite elephant food, on the near side of the fence, and waited. Soon the elephants came. First a bull pushed against the fence several times with his head; this failing, he turned round and pushed hindways. Sometimes a swaying motion forwards and backwards was tried. For 14 nights the elephants strove against the fence but were baffled. The physical problem was solved, but the financial problem remained. At this stage, the Waygood-Otis Lift Company came to the rescue and provided, free of charge, 40 miles of used lift-cable, and Port Elizabeth provided old tram lines cheaply. The Post Office hole-digger dug 2500 holes in a month, and by the end of 1954 the Armstrong fence had enclosed for the elephants 10 sq. m. of the Addo National Park. So far, the fence has stood the test (**22**; 16.11.55).

Observations after a severe hailstorm, and laboratory experiments, were used to determine the resistance of a large number of roofing materials to damage by hailstones. It was found that shingles of South African Pine and Cypress stood up to any but the most severe storms (**8**; June 1955).

U.S.A. A transverse section of the root system of a 25-year-old Southern Longleaf Pine of 10 in. diam., measuring 68 ft. by 10 ft. was exhibited whole at the 80th Annual Meeting of the American Forestry Association (**19**; 15.11.55).

A 4-day experimental study in the use of television cameras for fire detection was recently made by the California Division of Forestry in co-operation with a manufacturer. Equipment consisted of a remotely controlled camera mounted on a standard lookout tower. Several T.V. monitors or screens connected to the camera by co-axial cable were installed in a forestry station near by. The camera, controlled by the operator in the forestry station, could be rotated through 360° and could be stopped, or its direction changed, to survey any given area. Test smokes set off at distances of 7-13 miles from the camera, and the smoke from sawmill burners up to 18 miles away, were observed. (A trained observer with binoculars is considered to have a maximum efficient viewing distance of 15 miles from a lookout tower.) Problems that were found to require more study were the relationship between rate of scanning, size of lens, and field of vision; number of monitors that one observer can watch at one time, and an evaluation of the fatigue factor of an observer who is watching the monitor screens continuously. The study revealed that, to be effective, the television camera adapted to this use must be equipped with several lenses: a lens of low magnification and broad field of vision is needed for general scanning, and lenses of higher magnification are needed for close scrutiny of specific areas. The operator in the forestry station must be able to change the lenses at will (**14**; Sept. 1955).

On 19 July 1955 notice was published in the federal register of a proposed domestic quarantine on the European cockchafer, which is known to exist in relatively small areas in Connecticut, New York, and West Virginia. In all three states, active control and eradication programmes have been in progress for several years. The regulated articles are nursery stock, sand, soil, humus, compost and decomposed manure, and a certificate or permit will be required to move nursery stock and other regulated articles from the affected areas (**1**; 1.9.55).

Experiments sponsored by the Oregon Forest Products Laboratory showed that $\frac{1}{2}$ to $\frac{1}{3}$ of sawdust which had been exposed to high-level gamma rays, and about $\frac{2}{3}$ of that irradiated with beta rays, could be broken down in an artificial 'cow's stomach' (a test-tube filled with rumen juices) (**19**; 15.11.55).

New block flooring from low-quality hardwoods, that needs no tongues and grooves and can be laid directly on to concrete, is being tested in an office of the Madison Research Laboratory. Each 9-in.-square block consists of 6 or 7 pieces, 1-2 in. wide, from a variety of species. A shaped hardwood spline, made from oven-dry wood, is driven into two dovetail slots cut on the under side of each block. When this swells on re-absorbing moisture, it holds the pieces rigidly together (**19**; 1.10.55).

An extrusion process allowing the direct manufacture of moulded or shaped products from Chipcore, a wood-particle board, has been developed by the Chipcraft Company, Morristown, Tenn. (**19**; 15.11.55).

A cheap wood-fibre building board ('diffusion board') that filters poison gases, disease-laden particles and the radioactive fall-out of atomic explosions from the atmosphere, was recently announced by the U.S. Department of Agriculture and the Army Chemical Corps. 'Diffusion board' is the product of 3 years' research at the Forest Products Laboratory. It looks much like ordinary building fibreboard, but secret chemicals in it screen out gases and particles while letting oxygen in and CO_2 out. It can be manufactured with much the same equipment as that used to make ordinary building fibreboard, and from any species of wood. The work was done with military applications chiefly in view, such as shelters inside barracks, aircraft hangars and other military structures, but has equal value for use in houses and other civilian buildings during enemy attack (**14**; Oct. 1955).

The Kopper Company have built at their Lockhart, Ala., plant, a novel waste-heat recovery incinerator, a stack-type furnace, the heat from which is drawn off at the top of the stack and blown into a progressive-type dry kiln for poles, 600 ft. long. The refuse, ca. 85% bark and 15% trimmings, is burnt practically without emission of smoke (**19**; 1.11.55).

U.S.S.R. Seeds of 25 varieties of Apple, and some Cherry, Apricot and Almond seeds were placed in muslin bags and soaked in cold water for four days. The water was changed frequently to keep it cold. After soaking, the seed bags were placed on, and covered with, crushed ice, the water from the melted ice being allowed to flow away. The bucket was kept at a temperature of 2° C. and the ice replenished as needed. After 60 days in the ice, many of the seeds were sprouting; in 60-65 days 90% had germinated, compared with ca. 50% for similar seeds stratified in the usual way in sand at 3-7° (**1**; 1.11.55).

The Institute of Forest Technology, Lwow (Russian Poland) has experimented with cutting tools vibrating electromagnetically in the direction of the cut. It is claimed that cutting results were good, that no sawdust was produced, and that the cutting surfaces were smooth as if planed (**11**; 22.11.55).